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By HUANG BO, CHEN LIQING and HE LIN*

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Abstract

This study explores the relationship between government support and the behaviors of participants in a corporate bond market. The "implicit guarantee" of bonds is measured by two proxies: state-owned ownership and prestigious underwriter reputation. Bonds with these features have lower credit spreads and higher credit ratings. Since March 4, 2014—the first bond default event—evidence suggests that the effect of state-owned ownership on credit spreads and ratings is still pronounced, but the effect of underwriters' reputation has weakened. Our findings provide supporting evidence for the effectiveness of marketization in China's corporate bond market.

Keywords: Implicit guarantee，Corporate bond defaults, Credit spread, Credit rating

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1. Introduction

Investors and rating agencies are two important participants in a bond market. The capital market in emerging economies such as China, especially the bond market, has strong government support, which may affect the behaviors of investors and financial intermediaries in the market. So how will participants in bond markets respond to changes in government support? When government support begins to wane, which factor—issuers' ownership property or underwriters' reputation—has more influence on credit spreads and ratings? Our objective is to address these questions.

Government support for business is not unique to China, though its corporate bond market setting is particularly interesting for two reasons. First, the Chinese government plays an important role in business activities through its majority ownership in state-owned enterprises (SOEs) and its right to appoint top executives for SOEs (Allen, J. Qian, and M. Qian 2005; Huang 2003; Borisova and Megginson 2011; Li 2009; Chen, Shi, and Xu 2013; Arellano 2008). Although bonds issued by private enterprises are growing, SOEs' bonds still dominate the Chinese market.

Second, the first corporate bond default event in China occurred on March 4, 2014, before which the bond market had strong government support. At the time, defaults were viewed as a genuine impossibility. While the government has been energetically involved in the bond market, anomalies such as implicit guarantees and rigid payments also persist.

The implicit guarantee expectation refers to a scenario wherein investors and rating agencies expect a third-party guarantee on bonds. In other words, they believe that third parties, such as a local government, will provide a guarantee (or implicit support) to avoid default. These expectations alter the actual default probability of the bond, as well as the behaviors of investors and rating agencies in the market. In fact, the implicit guarantee is not guaranteed by law or regulation (Brandt and Li 2003; Cull and Xu 2003, 2005; Allen, J. Qian, and M. Qian 2005; Li 2009); its attributes are uncertain compared with the explicit guarantee.

The rigid payment expectation is a special phenomenon in China. Here, instead of normal bankruptcy and liquidation, a default bond is completely repaid by third parties who do not have any such legal responsibilities. Once the defaults occur, the implicit guarantee expectations are naturally broken. However, market participants continue to trust government support. This leads to a new rigid payment expectation that third parties, such as a government or the companies appointed by a government, could implement as support for payment.

Most extant literature on China's bond market is focused primarily on municipal bonds. Studying the market response to changing government support has not been an ideal subject of research. We find that municipal bonds have natural government support, and there is no variance in variables for government support. Besides, the credit spread formation mechanism is not rational. As such, we used corporate bond market data as samples. The first bond default in March 4, 2014 allows us to classify the sample into two subsamples. The empirical results show that, in the prior-default subsample, the credit spreads charged on the bonds issued by SOEs and reputable underwriters were lower, and the rating agencies also gave higher ratings to those bonds. In this period, investors valued the issuers' ownership property, and hence the property of the issuer was the dominant variable that influenced the investment decision of investors. Thus, state-owned property is indeed considered to be an implicit guarantee factor that reduces credit spreads. Moreover, both issuers and underwriters affected the bond rating during this period. Both also had incentives to exert influence on rating agencies to achieve higher rating and issue the bond

smoothly. In fact, the Issuer Pays model is the dominant rating payment model in China. Further, there is no default event in this period, so the cost of rating errors by the rating agencies was low. These two issues may drive rating agencies to give higher ratings on bonds of issuers with implicit guarantee factors.

After the first bond default on March 4, 2014, the market sentiment was more conservative. Both investors and rating agencies increased concerns about issuer's ownership. The bonds issued by SOEs were considered to be more secured assets that could obtain more straightforward support from the government.

However, the impact of underwriters on investors and rating agencies are no longer apparent. The empirical results of the after-default subsample show that, after the default event occurred, the significance level of the leading underwriter on the spreads and rating decreased. Meanwhile, the significance level of issuers' ownership considerably improved. The interactive analysis further confirmed these conclusions. When government support in the market weakens, investors and rating agencies tend to be more conservative. They emphasize more on factors representing the issuer's ownership than those representing the underwriter's reputation.

Our study contributes modestly to extant literature. First, we assumed for the first time that China's bond default event is a signal of weakening government support, and accordingly studied how investors and rating agencies have been reacting to this change. We conducted a more comprehensive study on the resulting behaviors of the two participants based on the bond issuer's ownership and the leading underwriter's reputation. We uniquely used the bond defaulted as the exogenous variable to depict the change in government support, and clarified the implicit guarantee factors of corporate bonds using two proxies: the issue's ownership background and the underwriter's reputation.

Second, China's specific social and political system determines the difference between SOEs and private enterprises in bond financing. The conventional proxy of implicit guarantee only refers to the issue's ownership. We also considered the implicit guarantee from large underwriters, thus enriching the literature on implicit guarantee and the behaviors of bond market participants.

Finally, we creatively dissected the expectation of government support into two phases: the implicit guarantee before the first default occurred and the rigid payment after this default occurred. Thus, we focused on the mechanism of two kinds of expectations under changing government support.

The remaining paper is organized as follows: we first review studies on corporate bonds' credit spreads and ratings. We then present hypotheses of China's corporate bond market. Then, we present the econometrical method and describe the data. In the penultimate section, we put forward our empirical analysis and results, and conclude the paper in the final section.

2. Institutional background and hypotheses development

2.1 Implicit guarantee and ownership effect

It is widely believed that governments significantly influence the bond market. Issuers under state ownerships or those with government connection are given preference in the bond rating and pricing procedures (Allen, J. Qian, and M. Qian 2005; Abad-Romero and Robles-Fernandez 2006). In a study on mature bond markets in developed countries, Ang, Cole, and Lin (2000) found that company ownership property and other similar non-financial factors influenced debt financing costs. However, such measurements were mostly confined to the measures of the company's government control (Fan 2016). The authors did not consider them to be

representatives of implicit guarantee factors.

Regarding immature bond markets in developing countries, studies have focused on invisible government guarantees on municipal bonds. Chen and Xu (2011) held that government support represented by an implicit guarantee influenced the municipal bonds' pricing mechanism. Wang (2015) emphasized that the investment return and explicit guarantee of Chinese municipal bonds would improve if the government strengthened its implicit guarantee. Based on the premise of implicit government guarantee, Yue (2010) and Chen and Xu (2011) noted that the investment return and credit rating influenced the mechanism of spreads. Faccio (2010) analyzed data of 450 enterprises with possible political connections in 35 countries to conclude that governments preferred to support and rescue enterprises with close connections. According to Altman (1990), the higher the gross domestic product (GDP) and GDP growth rate, the more likely it is that the local government can provide implicit guarantee, and the smaller the default risk and credit spread. Fisman (2001) showed that the political connections in the transition economy encouraged companies to obtain the implicit guarantee of the government. Johnson and Mitton (2001) studied Malaysia, Khwaja and Mian (2006) studied Pakistan, Cull and Xu (2005) studied China, and each showed that companies with political connections had greater preference and easier access to debt financing. These companies may have had higher default probabilities and lower profitability, but could pay lower interest rates to lenders.

The select literature reviewed above suggests that, in an immature market, bond pricing dependents on non-marketization factors, and investors generally have subjective expectations on implicit guarantee.

In China, company ownership usually falls into two categories: state-owned and private enterprises. These two groups have fundamental differences in their financing environment, strategic objectives, and governance structure (Brandt and Li 2003; Cull and Xu 2005; Allen, J. Qian, and M. Qian 2005). Thus, we distinguished between these ownership types of enterprises and regard state-owned property as a proxy indicator of the implicit guarantee.

2.2 Implicit guarantee and underwriter reputation

Extant literature has documented that financial intermediaries can improve information quality, and thus optimize capital allocation (Gande et al. 1995; Puri 1996; Carter and Manaster 1990; Dai, Jo, and Schatzberg 2010; Carter, Dark, and Singh 1998; Jo, Kim, and Park 2007; Yang, Gong and Xu 2017; Chen, Shi, and Xu 2013). For corporate bond issuance, underwriters have played a pivotal role. The reputation and strength of large underwriters might easily affect the pricing and rating process. Gande et al. (1995) found that investors were willing to pay higher prices and receive corresponding lower yields for bonds underwritten by big commercial banks compared with bonds underwritten by investment banks. Puri (1996) and Brau and Fawcett (2006) concluded similarly.

From the issuer's perspective, the underwriter plays the role of an information carrier who can deliver company information to investors through public disclosure (Chen, Shi, and Xu 2013). It is generally believed that highly reputed underwriters match with high-quality issuers, and vice versa. Good underwriters reasonably tend to recommend good quality bonds to investors to maintain their reputations in the market. Choosing an underwriter with higher reputation and strong strength can effectively enhance trust and clarify any doubts investors may have. This ultimately promotes the issuer's bond sales. Thus, reputable underwriters and high-quality bonds possibly choose each other.

From the investor's perspective, highly reputed underwriters are more honest, diligent, and trustworthy. Chen, Shi, and Xu (2013) called this the signaling hypothesis. Here, the reputation and strength of the underwriters may influence the investors' expectations of implicit guarantee and rigid payment, and thus influence investment decisions. Studies have documented that underwriters can affect managers' opportunistic motivation in earnings manipulation during the initial public offering (IPO) process (Teoh, Welch, and Wong 1998a; Teoh, Wong, and Rao 1998b; DuCharme, Malatesta, and Sefeik 2004; Darrough and Rangan 2005; Aharony, Lee, and Wong 2000; Shen, Chen, and Sun, 2015). However, few works have studied bond markets from this perspective. Nevertheless, underwriters in China's bond market may not be as effective as investors initially assumed—they have been found to prioritize the success of underwriting over developing investor trust. Therefore, they pressurize rating agencies to give a higher bond rating for successful issuance.

The bookkeeping system used in China's primary market was designed to help leading underwriters and issuers find an accurate price for a bond through negotiation. Based on interviews with market participants (including large domestic banks, investment banks, and bond rating agencies), we learned that, in bond underwriting practice, the sequential mechanism between rating, underwriting, and issuing is relatively complex, with no clear sequential relationship between the three. According to regulations, the rating should be obtained first, and then an underwriter is appointed. In practice though, potential underwriters are usually involved in the issuance consulting process in the first stage, even before bookkeeping starts. Besides, underwriters indeed impact the rating results. On one hand, the underwriting business is highly competitive, and underwriters must intensely compete for more business. Clearly, a higher rating helps potential underwriters to obtain business. Therefore, the rating result is decided by gaming all parties' interests through extensive negotiations and discussions. For example, the whole rating process takes about one month from the information collection stage to the information processing stage, then the preliminary rating stage, and finally the publication stage.

On the other hand, for companies that have never issued bonds before, underwriters have an incentive to persuade the rating agencies to give an AA rating to smoothen bond issuance. In this way, the ratings can meet the investment requirement for key institutional investors, such as the insurance company (Julio and Weisbach 2007; Jiang, Stanford, and Xie 2012).

In practice, there is often a synchronicity of rating and underwriting. We find that an underwriter plays a more active role in China's bond market, and hence a leading underwriter's reputation and strength is an important factor that cannot be ignored when we consider the bonds' implicit guarantee power.

2.3 Implicit guarantee and credit rating agencies

Extant literature has focused largely on rating distortions of rating agencies and inconsistent judgments by institutional investors. Studies in this area have suggested that a rating agency plays an important role in capital markets. It can investigate the issuer's financial conditions and consequently obtain private information (Abad-Romero and Robles-Fernandez 2006). Griffin and Sanvicente (1982) also noted the information advantage of rating agencies, which would be reflected in their rating results. Investors use these results to form their judgment toward companies' operating conditions and default risks. Thus, rating results can influence the financing costs of enterprises that must borrow money in the market. Grossman and Stiglitz (1980) further noted that an efficient market hardly exists, and credit rating agencies can significantly reduce the cost of information and increase market liquidity and

efficiency.

The reputation theory suggests that, in the context of repeated games, to obtain long-term excess returns, companies tend to avoid short-term fraudulent behaviors (Klein and Leffler 1981; Jiang, Stanford, and Xie 2012). Building and maintaining good reputation is vital to a rating agency. Any opportunistic behavior, such as misrepresenting, will lead to a loss in credibility and potential gains. However, the Issuer Pays model has been known to create conflicts of interest for rating agencies (Spatt 2008; Mathis, McAndrews, and Rochet 2009; Skreta and Veldkamp 2009; Bolton, Freixas, and Shapira 2012; C. Opp, M. Opp, and Harris 2013; Sangiorgi and Spatt 2013). A large chunk of a rating agency's revenue is drawn from issuers, while investors who use the rating results do not have to pay for it. Thus, issuers and underwriters may take a rating-shopping pattern, which, in turn, motivates rating agencies to distort real rating results to please issuers and underwriters (Fracassi, Petry, and Tate 2016).

Ultimately, the incentive for rating agencies to disseminate truthful information depends on which effect is dominant—but this needs to be tested empirically (Holthausen and Leftwich 1986; Jiang, Stanford, and Xie 2012; Jie, Qian, and Strahan 2012). Studies have already explained why the reputation mechanism cannot adequately restrict rating agencies to the truth through the dynamic reputation model; these studies include Mathis, McAndrews, and Rochet (2009) and Skreta and Veldkamp (2009). The authors analyzed the causes of the rating-shopping pattern from the perspective of investor rationality and complexity of financial assets. Bolton, Freixas, and Shapiro (2012) explained that competition in the rating industry reduced market efficiency. They held that, while investors were credulous toward rating results, rating agencies tended to underestimate the risk because issuers and underwriters preferred to obtain the most satisfactory rating results. For the same reason, regulations that rely on rating results also give rating agencies the incentive to distort accurate ratings (C. Opp, M. Opp, and Harris 2013; Ozerturk 2014; Poon and Chan 2008).

2.4 Development of hypotheses

The review of the literature cited above shows that participants (such as investors and credit rating agencies) in a bond market may have their own evaluations of and reactions to changes in government support. Before the default occurred, the implicit guarantee measured by issuers' ownership and underwriters' reputation were the leading factors that affected the rating results and credit spreads. After the first bond default occurred, rating agencies and investors began to attach more importance to the ownership of issuers, forming a rigid payment expectation that the government would eventually intervene and help the defaulted bonds in meeting payments. Moreover, rating agencies face high rating error costs, and they tend to be more conservative. Thus, the implicit guarantee measured by issuers' ownership becomes more important, while the implicit guarantee measured by underwriters' reputation becomes less significant.

Before the first default event occurred, the government was highly impactful. This allowed all participants in China's bond market to form strong expectations of the government's implicit guarantee. Rating agencies and investors consistently gave premiums of the implicit guarantee factors. We thus predicted that the ownership of the issuer will significantly affect the rating result and spreads. When investors and rating agencies are overconfident of the default risk, a negative correlation may exist between the underwriter's reputation and credit spread, but a positive relationship may exist between the underwriter's reputation and credit rating. Thus—

Hypothesis 1(a): The effect of state-owned enterprises can lead to lower spreads and higher rating than the effect of non-state-owned enterprises.

Hypothesis 1(b): The effect of reputable underwriters can lead to lower spreads and higher rating than the effect of non-reputable underwriters.

After the first default event occurred on March 4, 2014, market participants' expectations of government intervention were affected. Both investors and rating agencies became more conservative. However, their confidence in government intervention did not collapse immediately, with some still expecting the government to eventually intervene in the market to stabilize the bond market. Investors normally pursue any potential participants who will be involved in redemption procedures if a bond defaults; this convention was formed over a long period, undoubtedly making the government the best option out of this predicament. Therefore, investors respond by forming a rigid payment expectation that government will directly intervene and help the defaulted bonds in meeting payments.

Notably, the reactions of rating agencies' to the first default may be more severe compared with investor reactions. This is because the reputation of the former depends on whether they can accurately and objectively assess the default probability of a bond. If a bond default occurs (even if the bond is repaid eventually), the rating agency will face the punishment of rating failure, which will eventually harm its reputation and business. Thus

Hypothesis 2(a): The negative correlation between stated-owned ownership and spreads was pronounced when the March 2014 default occurred.

Hypothesis 2(b): The positive correlation between stated-owned ownership and credit rating was pronounced when the March 2014 default occurred.

Hypothesis 3(a): The negative correlation between reputable underwriters and spreads weakened when the March 2014 default occurred.

Hypothesis 3(b): The positive correlation between reputable underwriters and credit rating weakened when the March 2014 default occurred.

3. Data and methodology

3.1 Sample and variables

We selected the corporate bonds issued by listed companies from 2008 to 2015 as samples, excluding financial bonds, asset-backed securities, convertible bonds, and notes. The number of the original samples is 585. We further deleted some observations with missing financial information.

The implicit guarantee factors include the ability to obtain assistance from local government and related enterprises. We only require the economic and financial indicators of the local administrative region, and thus deleted bonds issued by central state-owned enterprises. Particularly, the bonds issued in 2007 are of this type, so the sample period ranges from 2008 to 2015. We deleted bonds issued by Tibet and other special regions to avoid the effect of abnormal values. Overall, we adopted 470 samples eligible for the requirement. We also collected 287 fiscal years' data on the economic conditions of the regional administrations.

The information on corporate bonds and the financial information of issuers used in the regressions were acquired from RESSET database and public annual reports on the listed companies. We used the natural logarithm of the bond amount, $Log(Bondsize)$, and the natural logarithm of the bond term, $Log(Term)$, as the control variables. The economic indicators and financial data of each regional administrative area come from China urban statistical yearbooks spanning 2008 to 2015. GDP (in 10^{12} RMB; unit ratio: %) and $GDP\ growth\ rate$ are disclosed in

the yearbooks. The $Loan-to-deposit\ ratio$ was calculated based on the year-end balance of RMB loans to RMB deposits. For the company's financial indicators, we adopted the principal component analysis (PCA) to simplify the problem and eliminate multicollinearity. We also used two quarters of financial data prior to the issuance. First, $Credit\ spreads$ is more affected by past financial information than by current financial information, which ensures that financial information is already available to bondholders at the time of bond issuance. Second, the regression of the current $Credit\ spreads$ on lagged financial information alleviates a potential endogeneity concern. Details on variable definition are shown in *Table 1*.

Table 1. Definitions of variables

Variables	Definition
Implicit guarantee	
SOE	A dummy variable that equals 1 if the corporation has the local stated-owned ownership and 0 otherwise
UNDRR	A dummy variable that equals 1 if the bonds' underwriter is the top five in underwriters' score order and 0 otherwise
Other implicit guarantee controls (OTHERCONTROLS)	
GDP	Local GDP (¥1 trillion)
LTD	Local loan-to-deposit ratio (%)
Bond's characteristics (BOND)	
Log(Bondterm)	The natural logarithm of the bond term, which is the period from the date of issuance to the date of last payment
Log(Bondsize)	The natural logarithm of bond amount (¥100 million)
Credit rating	The bond credit rating at the time of issuance in the survey
Collateral	A dummy variable that equals 1 if the corporation has explicit guarantees and 0 otherwise
Option	A dummy variable that equals 1 if the bond has investors protect covenant and 0 otherwise
Auditor	A dummy variable that equals 1 if the bonds' audit is the top ten in audits' order or the bond has at least two reputable audits in its underwriting and 0 otherwise
Post	A dummy variable that equals 1 if the bond is issued after the announcement of bond default event in 2014 and 0 otherwise.
Firm's financial characteristics(FIN)	
Total assets	The amount of company' s total assets (¥1 billion)
Liquidity ratio	The company's current assets/current liabilities*100%, lagged with two quarters (one year)
Cash ratio	The company's total amount of cash assets/current assets*100%, lagged with two quarters (one year)
Asset-liability ratio	The company's total liabilities/total assets*100%, lagged with two quarters (one year)
Interest coverage ratio	The company's earnings before interest and taxes /interest expenses lagged with two quarters (one year)
EBITDA	The company's earnings before interest, taxes, depreciation and amortization lagged with two quarters (one year)
ROE	The company's net profit/ equity*100%, lagged with two quarters (one year)
ROA	The company's net profit/total assets*100%, lagged with two quarters (one year)
Total assets turnover rate	The company's total revenue/total assets*100%, lagged with two quarters (one year)

Net profit growth rate	The company's current net profit growth/net profit*100%, lagged with two quarters (one year)
Net assets growth rate	The company's current net assets growth/net assets*100%, lagged with two quarters (one year)
Short-term solvency	The company's net operating cash flow/current liabilities*100%, lagged with two quarters (one year)
Long-term solvency	The company's net operating cash flow/total liabilities*100%, lagged with two quarters (one year)
Sales cash ratio	The company's net operating cash flow/sales*100%, lagged with two quarters (one year)
Profitability	The company's net cash flow/net assets*100%, lagged with two quarters (one year)
Short-term solvency factor	The constructed financial factor via PCA in which "short-term solvency", "liquidity ratio," and "cash ratio" have the largest weights
Long-term profitability factor	The constructed financial factor via PCA in which "long-term solvency," "asset-liability ratio," "net assets growth rate," and "interest coverage ratio" have the largest weights
Short-term profitability factor	The constructed financial factor via PCA in which "sales cash ratio" and "profitability" have the largest weights
Liquidity capacity factor	The constructed financial factor via PCA in which "interest coverage ratio" and "sales cash ratio" have the largest weights
Profitability factor	The constructed financial factor via PCA in which "return on equity" and "return on total assets" have the largest weights
Operational factor	The constructed financial factor via PCA in which "total assets turnover rate" and "net profit growth rate" have the largest weights

3.2 Measure of ownership effect

The ownership of the issuer is used as a proxy variable to measure the possibility of achieving government support and completing repayment. When companies are in bad financial conditions, the government prefers to rescue those with whom it has closer connections. Ownership property determines the extent of the local government's capacity of implicit guarantee. These will be reflected in the evaluations of investors and rating agents. SOE_i represents the ownership property of issuer i—a value of 1 represents the local state-owned enterprises, whereas 0 represents the private enterprises. SOE_i measures the government's implicit guarantee.

3.3 Measure of underwriter reputation

Carter and Manaster (1990) first used the IPO tombstone's underwriter ranking to measure underwriter reputation—such data are not available from China's authoritative organizations. We, in turn, followed the method in Megginson and Weiss (1991) and Chen, Shi, and Xu (2013) who used the underwriter's market share for measurement. This Megginson and Weiss (M–W) ranking system shows that a larger market share indicates a higher underwriter reputation.

We thus calculated the percentage of the total amount and number that the leading underwriter underwrote a year prior to the issuance to the entire corporate bond market. Then, we obtained the underwriters' scores and rankings by averaging the two percentages. That is—

$$\begin{aligned} &underwriter's\ reputation_t \\ &=underwriter's\ market\ share_t \\ &=\frac{1}{2}\left(\frac{\sum_{t-1} UNDRR\_AMT_j}{\sum_{t-1} UNDRR\_AMT}+\frac{\sum_{t-1} UNDRR\_NUM_j}{\sum_{t-1} UNDRR\_NUM}\right) \end{aligned} \tag{1}$$

where $UNDRR\_AMT_j$ is the amount underwritten by investment bank j. $UNDRR\_AMT$ is the amount underwritten in the entire corporate bond

market; $UNDRR\_NUM_j$ is the number of bonds underwritten by investment bank j. $UNDRR\_NUM$ is the number of bonds underwritten in the entire corporate bond market. We used the data one year prior to the issuance to form the lagged financial variables.

However, this method has limitations—the underwriter's market share is only one aspect of the underwriter's reputation, which comes with a contingency. For example, a larger number of listed companies in an area may naturally lead to higher market share of the underwriter in this area. Further, if a city or province (such as Guangdong Province, Zhejiang Province, Shanghai City, etc.) with strong economic development has a large number of companies that plan to issue bonds within a time period, then the market share of the local underwriter will greatly improve. However, it is difficult to determine whether such a local underwriter is reputable nationwide. Therefore, the market share does not fully reflect the reputation of underwriters. However, in this study, it is a practical and representative method.

Herein, we investigated both ownership effect and underwriter reputation effect on bond issuance. From 2008 to 2015, 81 financial institutions participated in the issuance of corporate bonds as the main underwriters. As observed in *Table 2*, the final score is ranked from high to low, with the top ten underwriters shown. The top five underwriters in terms of market share during the sample period were CITIC Security, China International Capital Corporation (CICC), UBS Security, GuoTai & Jun'An Security, and CSC Security. Compared with other small and medium-sized securities, large security firms exhibit more financial strength. Thus, these firms are highly reputed and are preferred by issuers and investors. This points to the underwriter reputation effect, confirming ***Hypothesis 1(b)***. As discussed in *section 2*, the issuers' ownership effect on investors and rating agencies may be pronounced when the default occurred, but the effect of financial intermediaries, such as underwriters, may have weakened.

Table 2. Underwriting reputation scores and rankings (2008–2015)

Lead underwriter	Underwriting number	Proportion	Underwriting amount	Proportion	Reputation scores	Rankings
CITIC Security	63	0.074	1781	0.132	0.103	1
China International Capital Corporation (CICC)	41	0.048	1453.95	0.107	0.078	2
UBS Security	49	0.057	908	0.067	0.063	3
GuoTai & Jun'An Security	48	0.056	899.9	0.066	0.062	4
CSC Security	51	0.060	761.75	0.056	0.058	5
BOC International Securities	39	0.045	686.1	0.050	0.048	6
China Merchants Securities	40	0.047	645.7	0.047	0.048	7
GuangFa Securities	38	0.044	601.7	0.044	0.045	8
HaiTong Securities	32	0.037	664.6	0.049	0.043	9
HuaTai United Securities	27	0.031	460	0.034	0.032	10
SUM	850	1	13487.74	1	1	81

Data source: RESSET financial database.
Note: The sample period is from 2008 to 2015. All Chinese corporate bond underwriters on Shanghai and Shenzhen Exchanges are included with the sample size $N = 81$. The underwriter's market share is measured by the M–W ranking system (Megginson and Weiss 1991). It is measured by the average percentage of the total amount and number that the issuer's lead underwriter underwrote two quarters prior to the bond issuance.

To effectively capture the effect of the underwriters' reputation, we defined a dummy variable, $UNDRR$, taking the value of 1 if the underwriters' market share one

year prior to an issuance ranks in the top five, but 0 otherwise. For the sake of generating quality results, we also used the reputation score in the robustness test.

3.4 Measure of credit spread

In general, the yield of the Treasury bond is a risk-free interest rate. The credit spreads of the corporate bond are the difference between the Treasury yield and the bond yield, with the same maturity. This method is workable as the bonds are all issued at par value and the term structure of interest rates are relatively flat in China. As the term of the corporate bond does not exactly match the term of the Treasury bond, we matched the corporate bond and the Treasury bond using the linear interpolation method. Specifically, the Treasury yields' data come from the official website of China Securities Depository & Clearing Corporation Limited (CSDCC). We calculated the $Credit\ spreads$ as follows—

$$\begin{aligned} &Credit\ spreads_i \\ &=Yield\ to\ maturity\ of\ bond"i"-Yield\ of\ Treasury\ bond\ with\ the\ same\ maturity \\ &where \\ &Yield\ of\ Treasury\ bond=\left\{\begin{array}{l}\left[\dfrac{Yield\ on\ Treasury\ bond_{next\ period}-Yield\ on\ Treasury\ bond_{prior\ period}}{next\ period-prior\ period}\right] \\ \times(current\ time-prior\ period) \\ +Yield\ on\ Treasury\ bond_{prior\ period}\end{array}\right\} \end{aligned} \tag{2}$$

3.5 Measure of credit rating

Table 3 is a statistical analysis of the credit ratings in China's corporate bond market. Only ten corporate bonds were issued in 2008. As observed, the corporate bond market had grown slowly before 2011. After major improvements and development of the bond market in 2011, the number of issuances increased annually, reaching 104 in 2012. After 2014, with frequent defaults, the number of bond issuances fell back for two years. Due to a series of favorable policies in 2015, debt financing was widely adopted by listed companies at the time, when the stock market was depressed.

Almost all bond ratings were above AA, accounting for 44.56% of all ratings, while the AA+ rating accounted for 30.49%; the AAA rating accounted for 22.17%, only one bond was rated A+. There is no bond below A+. The rating results in China were dominated by AA and AA+ in the entire sample for the examined period. In general, only central and provincial state-owned companies can receive AAA rating, and AA+ is the second best in all ratings. The companies receiving such ratings should have strong debt repayment ability, with low investment risk for investors. More importantly, these companies usually have good political connections with the government.

According to the relevant provisions of the *Securities Law*, *Corporation Law*, and *Corporate Bond Issuance Pilot Approach* in 2007, the issuance of corporate bonds should meet the minimum rating requirements. Consequently, most bonds in the market can receive an AA rating. It is difficult for investors to identify real default risk, and they are normally reluctant to use these AA results to form their judgment of companies' financial conditions and default risks. Thus, the spreads of AA bonds can

be high, and thus difficult to sell. Many institutional investors only invest in *investment-grade* bonds that receive AA+ or above ratings.

In the regression, as the rating is an ordered variable, we set A+ to be equal to 1, AA- equal to 2, AA equal to 3, AA+ equal to 4, and AAA equal to 5.

Table 3. Distribution of bond credit ratings (2008–2015)

Year	A+	AA-	AA	AA+	AAA	Total
2008	0	1	1	4	4	10
2009	0	1	17	13	5	36
2010	0	0	4	4	2	10
2011	0	0	28	20	16	64
2012	0	1	53	31	19	104
2013	1	2	21	13	19	56
2014	0	4	25	15	16	60
2015	0	3	60	43	24	130
Total	1	12	209	143	105	470
ratio%	0.21	2.56	44.56	30.49	22.17	100

Data source: RESSET financial database.
Note: The sample period is from 2008 to 2015. All Chinese corporate bond rating agencies on Shanghai and Shenzhen Exchanges are included with the sample size $N = 470$.

3.6 Measure of other variables

In the model, we included some variables reflecting the bond's typical characteristics. $Term$ is the period from the issuance date to the day of last payment. $Log(Bondterm)$ is the natural logarithm of the period from the issuance date to the day of last payment. $Log(Bondsize)$ is the natural logarithm of the bond amount at the time of issuance in the survey. The model also included three dummy variables. A "put option" on a bond allows bond investors to force the issuer to pay back the principal before maturity. Thus, we expected the put option to be inversely correlated with bond spreads. $Option$ equals 1 if the bond has the investors protect covenant, but 0 otherwise. The variables also included bond collateral and auditor background factors. $Collateral$ equals 1 if the bond has explicit guarantees, but 0 otherwise. $Auditor$ equals 1 if the bonds' audit is the top ten in audits' order or has at least two audits in its underwriting, but 0 otherwise. $POST$ is another dummy variable that equals 1 if the bond is issued after the first bond default event in 2014, but 0 otherwise.

As discussed in the above section, we employed financial data of two quarters prior to the issuance. For the control variables, $Liquidity\ ratio$ and $Cash\ ratio$ reflect the ability to repay, which are the so-called short-term solvency—the larger the ratio, the narrower the credit spreads. $Liquidity\ ratio$ was calculated by the company's current assets/current liabilities*100%, lagged with two quarters. $Cash\ ratio$ was calculated by company's total amount of cash assets/current assets*100%, lagged with two quarters. $Asset-liability\ ratio$ reflects the company's long-term solvency—the lower the ratio, the smaller the company's financial leverage, and the smaller the credit spreads; it was calculated by the company's total liabilities/total assets*100%, lagged with two quarters. The $Interest\ coverage\ ratio$ measures the company's ability to pay interest. It was calculated by the company's earnings before interest and taxes/interest expenses, lagged with two quarters. $Return\ on\ equity$,

$Return\ on\ total\ asse$,$Total\ assets\ turnover\ rate$, and $Net\ profit\ growth\ rate$ reflect the profitability of the company. The detailed formulae are in presented in *Table 1*. We found that the larger the ratios, the narrower the credit spreads, and the higher the ratings.

As there are many financial indicators that reflect the company's solvency and profitability abilities, and all indicators may have mutual influence, we first applied the most important and frequently used financial measurements, that is, liquidity, return on assets (ROA), asset-liability ratio, and long-term solvency. In the robustness tests, we added more company financial controls. We constructed six factors via PCA. In this way, we simplified these financial indicators and extracted the common financial factors in the subsequent multiple regressions. For example, regarding the short-term solvency factor, the financial indicators of $Liquidity\ ratio$ and $Cash\ ratio$ take up larger weights than other indicators. In the operational factor, $Net\ profit\ growth\ rate$ and $Total\ assets\ turnover\ rate$ take up the largest weights.

3.7 Descriptive statistics

Table 4 reports the descriptive statistics for all the variables. We winsorized all financial reporting data at 1% for extreme value consideration. For 2008 to 2015, the mean and median values of $Credit\ spreads$ are 2.54 and 2.36, respectively; the mean and median values of $Credit\ rating$ are 3.72 and 4, respectively. The mean (median) values of SOE are 0.53 and 1, respectively. This indicates that, in China's corporate bond market, SOEs and non-state-owned enterprises (NSOEs) account for half the percentage, with SOEs faring slightly higher. The mean (median) of $UNDRR$ is 0.47 (0). The mean (median) of $SCORE$ is 0.04 (0.02); the mean (median) of $POST$ is 0.39 (0); the mean (median) of $Collateral$ is 0.48 (0); the mean (median) of $Option$ is 0.42 (0). The mean value of $Total\ assets$ for issuers is 29 billion RMB, while the median value is 14 billion RMB, indicating a typical right-skewed distribution. The total issuing amount, $Bondsize$, has a mean (median) value of 12.79 (10) million RMB. The natural logarithm of the bond amount, $Log(Bondsize)$, has a mean (median) value of 2.25 (2.3). The natural logarithm of the bond term, $Log(Bondterm)$, has a mean (median) value of 1.61 (1.61). A mean of 66% of the sample is audited by a Big Ten auditor ($Auditor$).[2]

The sample distribution by year is reported in *Table 5*. The dependent variable, $Credit\ spreads$, fluctuates during the period. The statistics show that, before the first default, the $Credit\ spreads$ were higher; its mean of 2.770 narrowed to 2.343 after the first default. According to this evidence, the default did not negatively alter the investors' expectation of rigid payment toward government support. *Table 5* shows that the mean of $Credit\ rating$ declined marginally, while the mean of SOE fluctuated from 55.8% before the first default to 52.3% after the first default. This complex phenomenon echoes the trend of privatization reform and the government's strong impact on China's bond market.

Table 4. Descriptive statistics for key variables

Variable	N	Mean	p25	p50	p75	Std. Dev.
Credit spreads	470	2.53	1.67	2.36	3.26	1.15
Credit rating	471	3.72	3	4	4	0.84
SOE	472	0.53	0	1	1	0.5
UNDRR	472	0.47	0	0	1	0.5
SCORE	466	0.04	0	0.02	0.07	0.06
POST	473	0.39	0	0	1	0.49
Collateral	472	0.48	0	0	1	0.5
Option	473	0.42	0	0	1	0.49
Auditor	473	0.65	0	1	1	0.48
Log(Bondterm)	472	1.61	1.61	1.61	1.61	0.3
Log(Bondsize)	472	2.25	1.7	2.3	2.71	0.78
Total asset (￥1 billion)	433	29	6.4	14	34	45
Liquidity	429	152.53	82.78	125.74	182.17	124.35
ROA	433	2.39	0.66	1.58	3.33	2.5
Asset-liability ratio	433	54.24	42.09	56.48	66.97	16.92
Long-term solvency	433	4.46	-2.24	2.83	9.17	19.47
Short-term solvency factor	433	0	-0.05	-0.01	0.04	0.07
Long-term profitability factor	433	0.06	-0.13	0.01	0.22	0.26
Short-term profitability factor	433	-0.16	-0.48	0	0.32	0.64
Liquidity capacity factor	433	0.06	-0.12	0.03	0.22	0.26
Profitability factor	433	0	-0.02	-0.01	0.01	0.03
Operational factor	433	-0.01	-0.08	0.01	0.07	0.12
GDP (¥1 trillion)	428	0.56	0.13	0.28	0.8	0.61
LTD	350	109.03	55.56	78.62	150	80.61

Data source: RESSET financial database.
Note: The sample period is from 2008 to 2015. All Chinese corporate issuers on Shanghai and Shenzhen Exchanges are included with $N = 470$ observations. All financial reporting data are winsorized at 1%.

Table 5. Means of variables by calendar time

Variable	Before March 4, 2014	After March 4, 2014
Credit spreads	2.762	2.18
Credit rating	3.759	3.654
SOE	0.559	0.489
UNDRR	0.497	0.419
SCORE	0.045	0.032
POST	0	1
Collateral	0.601	0.285
Option	0.266	0.647
Auditor	0.717	0.556
Log(Bondterm)	1.645	1.561
Log(Bondsize)	2.244	2.251
Totalasset	25	35
Liquidity	147.198	161.323
ROA	2.859	1.598
Asset-liability ratio	51.977	58.033
Long-term solvency	4.875	3.77
Short-term solvency factor	0.008	-0.014
Long-term profitability factor	0.083	0.008
Short-term profitability factor	-0.207	-0.075
Liquidity capacity factor	0.066	0.05
Profitability factor	-0.003	-0.007
Operational factor	-0.017	-0.009
GDP (¥1 trillion)	0.55	0.56
LTD	122.969	64.869

Data source: RESSET financial database.

Table 6 reports the Pearson's correlation coefficients among the variables used in this study—that is, it reports the correlations among the key variables, as well as those among the control variables. These correlation coefficients are generally within a normal range, which suggests that the variables are free of multicollinearity problems. Moreover, to further ensure that the empirical model is not significantly affected by multicollinearity problems, we checked the variance inflation factors (VIFs) of the regression. The test indicates that the VIFs of all variables are less than 8, with the mean of VIFs equaling 4.62.

Table 6. Pearson correlations of dependent variables and independent variables

	Credit spreads	Credit rating	SOE	UNDRR	Collateral	Option	Auditor	Term	Bondsize	Total asset	Liquidity	ROA	Asset-liability ratio	Long-term solvency
Credit spreads	1													
Credit rating	-0.583***	1												
SOE	-0.365***	0.386***	1											
UNDRR	-0.223***	0.267***	0.085*	1										
Collateral	0.120***	0.238***	0.225***	-0.097**	1									
Option	-0.107**	-0.152***	-0.064	-0.067	-0.198***	1								
Auditor	0.066	-0.011	0.057	0.009	0.06	-0.066	1							
Log(Bond term)	-0.092**	0.045	0.135***	-0.056	0.036	0.316***	0.021	1						
Log(Bond size)	-0.342***	0.471***	0.129***	0.319***	-0.089*	-0.021	0.038	0.061	1					
Total asset	-0.357***	0.432***	0.114**	0.221***	-0.076	-0.046	0.078	0.052	0.568***	1				
Liquidity	-0.043	0.011	0.004	-0.027	-0.033	-0.039	-0.061	-0.016	-0.116**	-0.238***	1			
ROA	-0.127***	0.126***	0.041	-0.029	-0.002	-0.049	-0.059	0.005	-0.093*	-0.158***	0.765***	1		
Asset-liability ratio	0.115**	-0.131***	-0.082*	0.003	-0.024	0.05	0.092*	0.011	0.044	0.052	-0.669***	-0.817***	1	
Long-term solvency	-0.114**	0.106**	0.05	0.037	-0.035	-0.003	0.032	0.116**	0.087*	0.105**	0.253***	0.536***	-0.568***	1

3.8 Econometric models

Next, we employed a multivariate analysis to empirically test the three hypotheses. We first used the $Credit\ rating$ and the $Credit\ spreads$ of the corporate bond as proxy variables to test the responses of the rating agency and investor. We then verified the ownership effect and underwriter reputation effect on credit rating and credit spreads in different market stages.

The multiple regression models are—

$$Credit\ \ spreads_i = \alpha_1 SOE_i + \alpha_2 UNDRR_i + \alpha_3 FIN_i + \alpha_4 BOND_i + \alpha_5 OTHERCONTROLS_i + Time\ \ dummies + Industry\ \ dummies + \varepsilon \quad (3)$$

$$Credit\ \ rating_i = \beta_1 SOE_i + \beta_2 UNDRR_i + \beta_3 FIN_i + \beta_4 BOND_i + \beta_5 OTHERCONTROLS_i + Time\ \ dummies + Industry\ \ dummies + \varepsilon \quad (4)$$

where $Credit\ spreads_i$ and $Credit\ rating_i$ represent the credit spreads and credit rating of bond i, respectively. FIN_i includes the variables reflecting the issuer's firm level financial characteristics, and $BOND_i$ includes the variables reflecting the bond's characteristics. $OTHERCONTROLS_i$ includes the variables reflecting the implicit guarantee by the local government which are frequently used by extant literature. The specific variables are descripted in *Table 1.* We also constructed the dummy variables $Time\ dummies$ and $Industry\ dummies$ to control for the year of bond issuance and the industry of the issuers. Particularly, we set six time dummies for $Time\ dummies$. For example, for 2008, we set "year08" equal to 1, but 0 otherwise. Similarly, we set dummy variables for the industry according to the industry classification benchmark of China Securities Regulatory Commission (CSRC).

4. Empirical analysis and the results

4.1 Baseline results

The first default in 2014 is a remarkable event in the development of China's bond market. We divided the relevant data into two stages: 2008–2014.3.4 and 2014.3.4–2015, as the baseline. We then proceeded with an interactive analysis.

After the bond default event broke out, studies showed that expectations of implicit guarantee and rigid payment were negatively affected; since then, the corporate bond market has been going through gradual marketization. Contrariwise, scholars have also noted that market participants continued holding rigid payment expectations, while full marketization of the corporate bond market has still been a distant reality.

We estimated various regression models of $Credit\ spreads$ and $Credit\ rating$ before and after the default event of March 4, 2014. Particularly, we selected the outbreak of the bond default in 2014 as the time point and divided the samples into two subsamples: the prior-default subsample from 2008 to 2014.3.4 and the after-default subsample from 2014.3.4 to 2015. We studied the heterogeneous reactions of the investors and rating agencies under weakening government support. Panels A and B of *Table 7* are baseline regression models. In Panel A, the dummy variable $UNDRR$ takes the value of 1 if the bond's underwriter is in the top five underwriting score rankings, but 0 otherwise. In Panel B, we directly used the net underwriting scores that are calculated by the underwriting amount and number using the M–W system. Panels A and B show similar results.

We first studied the influence of the ownership and underwriter reputation on $Credit\ spreads$. The empirical results are shown in *Table 7*.

Table 7. Subsample results by using financial indicators

Panel A: Dummies for TOP 5 of Net UNDRR Score: Credit spreads and Credit rating				
	(1)	(2)	(3)	(4)
	2008-2014.3.4	2014.3.4-2015	2008-2014.3.4	2014.3.4-2015
Variables	Credit spreads	Credit spreads	Credit rating	Credit rating
SOE	-0.349***	-1.196***	0.279***	0.721***
	(-2.71)	(-4.06)	(3.09)	(4.18)
UNDRR	-0.238**	-0.171	0.241**	-0.129
	(-2.42)	(-0.96)	(2.36)	(-0.60)
Credit rating	-0.517***	-0.501**		
	(-5.80)	(-2.28)		
Collateral	0.054	0.842***	0.426***	0.476**
	(0.43)	(3.38)	(4.43)	(2.53)
Option	-0.169	-0.274	-0.078	-0.196
	(-1.39)	(-1.39)	(-0.83)	(-1.13)
Auditor	-0.110	0.214	0.030	0.257
	(-1.03)	(0.87)	(0.32)	(1.64)
Term	-0.191	0.108	-0.119	0.228
	(-1.11)	(0.34)	(-0.88)	(0.93)
Log(Bondterm)	-0.272***	0.217	0.396***	-0.026
	(-3.59)	(1.25)	(5.55)	(-0.20)
Log(Bondsize)	0.000	-0.000	0.000***	0.000**
	(0.23)	(-0.53)	(3.85)	(2.04)
Liquidity	0.000	0.001	-0.001**	-0.001
	(1.37)	(0.55)	(-2.04)	(-1.08)
ROA	-0.044**	-0.011	0.036**	-0.051
	(-1.98)	(-0.20)	(2.01)	(-1.38)
Asset-liability ratio	0.003	0.012	-0.007*	-0.013**
	(0.77)	(1.55)	(-1.72)	(-2.37)
Long-term solvency	-0.004	-0.016	-0.006*	0.026***
	(-1.11)	(-1.33)	(-1.96)	(2.68)
GDP	-0.000	-0.000	0.000***	-0.000
	(-0.49)	(-1.34)	(2.84)	(-0.07)
LTD	-0.000	0.002	-0.000	0.002
	(-0.05)	(0.29)	(-0.23)	(0.56)
Constant	5.862***	4.505***	3.173***	2.057***
	(9.64)	(4.18)	(6.28)	(2.66)
Time dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Observations	249	76	251	76
R-squared	0.597	0.791	0.606	0.727
Adjust R-squared	0.542	0.679	0.554	0.590
Panel B: Net UNDRR Score: Credit spreads and Credit rating				
	(1)	(2)	(3)	(4)
	2008-2014.3.4	2014.3.4-2015	2008-2014.3.4	2014.3.4-2015
Variables	Credit spreads	Credit spreads	Credit rating	Credit rating
SOE	-0.376***	-1.248***	0.304***	0.707***
	(-2.92)	(-4.16)	(3.34)	(4.06)
UNDRR_SCORE	-1.760***	0.923	1.493**	-0.414
	(-3.21)	(0.37)	(2.26)	(-0.17)
Credit rating	-0.514***	-0.490**		
	(-5.70)	(-2.21)		
Collateral	0.054	0.850***	0.421***	0.477**
	(0.44)	(3.27)	(4.33)	(2.54)

Panel B: Net UNDRR Score: Credit spreads and Credit rating				
Option	-0.141	-0.250	-0.106	-0.190
	(-1.16)	(-1.27)	(-1.13)	(-1.07)
Auditor	-0.110	0.258	0.032	0.276*
	(-1.06)	(1.05)	(0.35)	(1.80)
Term	-0.239	0.126	-0.072	0.239
	(-1.35)	(0.39)	(-0.52)	(0.96)
Log(Bondterm)	-0.283***	0.223	0.408***	-0.022
	(-3.74)	(1.26)	(6.07)	(-0.16)
Log(Bondsize)	0.000	-0.000	0.000***	0.000**
	(0.86)	(-0.47)	(3.79)	(2.07)
Liquidity	0.001	0.001	-0.001**	-0.001
	(1.48)	(0.54)	(-2.12)	(-1.17)
ROA	-0.042*	-0.007	0.033*	-0.048
	(-1.95)	(-0.12)	(1.92)	(-1.28)
Asset-liability ratio	0.004	0.012	-0.007*	-0.013**
	(0.85)	(1.53)	(-1.85)	(-2.34)
Long-term solvency	-0.004	-0.018	-0.006*	0.025***
	(-1.21)	(-1.42)	(-1.86)	(2.67)
GDP	-0.000	-0.000	0.000***	-0.000
	(-0.78)	(-1.26)	(3.07)	(-0.01)
LTD	-0.000	0.002	-0.000	0.002
	(-0.25)	(0.28)	(-0.07)	(0.58)
Constant	6.099***	4.404***	2.959***	2.002**
	(10.05)	(3.96)	(5.66)	(2.49)
Time dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Observations	249	76	251	76
R-squared	0.600	0.789	0.605	0.725
Adjust R-squared	0.545	0.677	0.553	0.587

Note: This table presents regression estimates of corporate bonds' $Credit\ spreads$ and $Credit\ rating$ on SOE and $UNDRR$ before and after the first default event occurred on March 4, 2014. In Panel A, we use dummy variable $UNDRR$ that equals 1 if the bond's underwriter is in the top five underwriting score ranking, but 0 otherwise. In Panel B, we directly use the net underwriting score, which is calculated based on the underwriting amount and number by the M–W system. We include financial controls simultaneously in the main regressions. The control variables and returns are winsorized at the 1st and 99th percentiles. All the standard errors are clustered in the regressions at the company and year level. ***, **, and * indicate that the parameter estimation is significantly different from 0 at the 1%, 5%, and 10% levels, respectively.

The dependent variable in columns (1) and (2) is $Credit\ spreads$. In columns (3) and (4), the dependent variable is $Credit\ rating$. The key variables of interest are SOE and $UNDRR$, which are the proxies of the ownership effect and underwriter reputation effect before and after the first default. All the models include industry dummies (defined at the two-digit CSRC level) and year dummies because the impacts of the default on some industries are heterogeneous. We also controlled for the firm's accounting factors two quarters prior to the issuance.

Columns (1) and (3) show that bonds with government ownership and higher underwriting ranking yielded significantly lower $Credit\ spreads$ and higher $Credit\ rating$. Columns (2) and (4) show a similar relationship. These results confirm hypotheses ***1(a)*** and ***1(b)***. The coefficient of $SOEs$ for the prior-default subsample (column 1) is significantly negative (-0.349 with a t-value of –2.71). The results suggest that state-owned issuers can effectively reduce $Credit\ spreads$. For the after-default subsample (column 2), the negative correlation is pronounced. The coefficient of SOE is -1.196, with a t-value of -4.06, which confirms ***Hypothesis 2(a)***.

Correspondingly, NSOEs must provide higher risk premium as compensation. The results indicate that investors consider state-owned property to reflect an implicit guarantee. Regarding the economic status in 2008–2013, the corporate bond market was in its initial stage and was strongly affected by government control. Because of strong government support, no defaults occurred. Investors at this stage were risk-neutral and bond spreads did not reflect the exact risk premium. State-owned corporate bonds, which were highly demanded, did not need to offer high interest rates to attract investors. Meanwhile, private enterprises had to actively raise interest rates to attract investors and issue bonds successfully.

For $Credit\ rating$, the coefficient of $SOEs$ for the prior-default subsample (column 3) is significantly positive (0.279, with a t-value of 3.09), suggesting that stated-owned issuers can effectively improve their $Credit\ rating$. For the after-default subsample (column 4), the positive correlation is pronounced. The coefficient of SOE is 0.721, with a t-value of 4.18, which confirms ***Hypothesis 2(b)***.

The coefficient of $UNDRR$ for the prior-default subsample (column 1) is also significantly negative (-0.238 with a t-value of -2.42), but economically smaller than the SOE effect. Thus, with reputable underwriters, the credit spreads can be reduced, but the ownership effect dominates. For the after-default subsample (column 2), this negative correlation weakens. The coefficient of $UNDRR$ is not significantly different from 0. For $Credit\ rating$, the coefficient of $UNDRR$ for the prior-default subsample (column 3) is significantly positive (0.241 with a t-value of 2.36), suggesting that, with reputable underwriters, the credit ratings could be improved. For the after-default subsample (column 4), the positive correlation vanishes, even presenting a reverse trend. These results confirm hypotheses ***3(a)*** and ***3(b)***.

The negative coefficient of $UNDRR$ above may be interpreted as follows. First, since the cost of rating failure has risen significantly, the stronger and more persuasive the behavior of reputable underwriters, the more suspicious is the quality of bonds, as per the judgment of rating agencies. Second, because most defaulted bonds were issued by reputable underwriters, the rating agencies cast doubt on the reputation of these underwriters in the first place after the default. The rating agencies' attitude toward small underwriters does not change much before and after the default.

These results verify the following predictions. In the prior-default period, there is no bond default and the cost of rating failures is low. The Issuer Pays model intrigues agencies to provide inflated ratings to attract more business. Higher ratings then help issuers and underwriters to issue bonds smoothly. The issuers and underwriters are incentivized to persuade rating agencies to give higher ratings. However, the reputation and strength of the underwriters do not have a significant impact on the spreads and ratings in the after-default period, and even the direction of the results is inconsistent with the former period. In this period, the ratings agencies are more cautious in the rating process, since the cost of rating failure has risen significantly. Though refusing to meet the requirements of the issuers and underwriters on inflating rating results may lead to a loss of business, the punishment of rating failures is so high that agencies no longer want to take the risk and scar their reputation. Meanwhile, investors pay more attention to find more direct and stronger supporting power to fulfill bond payments. The originally dominating ownership effect herein is pronounced. The issuers with government connection are preferred in the rating and pricing procedures; especially in the China's corporate bond market, this ownership effect has been widely viewed as a guarantee of rigid payment after frequently occurring bond defaults. This is reflected in the investor's bidding strategies.

The following results of the control variables are also noteworthy. The variable $Credit\ rating$ in columns (1) and (2) negatively correlates with $Credit\ spreads$ at less than the 10% level in all model specifications, which is consistent with our prediction and prior studies (Fracassi, Petry, and Tate 2016; Holthausen and Leftwich 1986; Jiang, Stanford, and Xie 2012; Jie, Qian, and Strahan 2012). $Collateral$ is significantly positive in the $Credit\ rating$ functions, but not significantly different from 0 in the $Credit\ spreads$ functions. This result confirms that, in China's corporate bond market, collateral information only affects rating results, but cannot reduce the debt cost. Options like the put option are expected to be inversely correlated with credit spreads because they allow bondholders to make the issuer pay back the principal before maturity. However, even if the sign for $Options$ is negative, such bond covenants are not significant in China's bond market. The sign on $Auditor$ is also negative in the $Credit\ spreads$ functions, but positive in the $Credit\ rating$ functions, though this is not significant. This result confirms the auditor's role in lowering spreads and improving ratings.

In addition, we selected some important financial variables that are frequently used in extant literature: ROA, leverage, liquidity, and long-term solvency. We included these financial controls simultaneously in the main regressions. Their coefficients are also consistent with extant literature.

4.2 Interaction analysis for the overall sample

One concern with the specifications reported in panels A and B is that the pronounced and weakened effects mentioned in hypotheses ***2(a)***, ***2(b)***, ***3(a)***, and ***3(b)*** by subsamples are not robust. To address this possibility, we subjected the overall sample to an interaction analysis and compared the results to the results of the subsamples. Particularly, we added SOE, $UNDRR$ variables, and the interaction terms of $POST \times SOE$ and $POST \times UNDRR$ to examine whether the correlation between the underwriter's reputation and credit spreads (credit rating) changes after the first bond default event. $POST$ is an indicator variable defined in *Table 1* that equals 1 if the bond is issued after the first bond default, but 0 otherwise. The empirical results are shown in *Table 8*.

Table 8. Interaction analysis by using the financial indicators

	Panel A: Dummies for TOP 5 of Net UNDRR Score: Credit spreads and Credit rating		Panel B: Net UNDRR Score: Credit spreads and Credit rating	
	(1)	(2)	(3)	(4)
Variables	Full Credit spreads	Full Credit rating	Full Credit spreads	Full Credit rating
SOE	-0.389***	0.254***	-0.409***	0.266***
	(-3.28)	(2.88)	(-3.40)	(3.00)
UNDRR	-0.324***	0.264***	-1.752***	1.313**
	(-3.06)	(2.94)	(-3.54)	(1.99)
POST	-0.617*	-0.009	-0.742**	0.221
	(-1.85)	(-0.03)	(-1.97)	(0.61)
POST×SOE	-0.659**	0.374*	-0.562*	0.378
	(-2.35)	(1.88)	(-1.94)	(1.65)
POST×UNDRR	0.419*	-0.182	-0.213	-2.074
	(1.84)	(-0.98)	(-0.07)	(-0.81)
Credit rating	-0.523***		-0.539***	
	(-6.30)		(-6.49)	
Collateral	0.148	0.454***	0.174	0.433***
	(1.34)	(5.23)	(1.58)	(4.93)
Option	-0.196*	-0.127	-0.208**	-0.125
	(-1.95)	(-1.34)	(-2.07)	(-1.36)
Auditor	-0.102	0.131	-0.065	0.103
	(-0.99)	(1.53)	(-0.64)	(1.18)
Log(Bondterm)	-0.216	0.015	-0.194	-0.014
	(-1.47)	(0.11)	(-1.31)	(-0.10)
Log(Bondsize)	-0.158**	0.279***	-0.203***	0.324***
	(-2.09)	(4.08)	(-2.81)	(4.88)
Total asset	0.000	0.000***	0.000	0.000***
	(0.06)	(4.08)	(0.58)	(3.87)
Liquidity	0.000	-0.000	0.001	-0.000
	(1.12)	(-1.42)	(1.20)	(-1.58)
ROA	-0.041**	0.020	-0.042**	0.021
	(-2.23)	(1.37)	(-2.29)	(1.39)
Asset-liability ratio	0.005	-0.007*	0.005	-0.007**
	(1.36)	(-1.96)	(1.31)	(-2.05)
Long-term solvency	-0.005	-0.002	-0.005	-0.002
	(-1.49)	(-0.72)	(-1.59)	(-0.69)
GDP	-0.000	0.000*	-0.000*	0.000**
	(-1.50)	(1.88)	(-1.76)	(2.01)
LTD	0.000	0.000	0.000	0.000
	(0.27)	(0.08)	(0.06)	(0.17)
Constant	5.777***	2.224***	6.019***	2.042***
	(11.00)	(4.36)	(11.23)	(3.80)
Time dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Observations	325	327	325	327
R-squared	0.635	0.557	0.630	0.551
Adjust R-squared	0.589	0.504	0.584	0.497

Note: This table presents regression estimations of corporate bonds' $Credit\ spreads$ and $Credit\ rating$ on the interactions $POST \times SOE$ and $POST \times UNDERR$ using the financial indicators instead of the principal component analysis. $Post$ is an indicator variable defined in *Table 1* that equals 1 if the bond is issued after the announcement of the first bond default event, but 0 otherwise. In Panel A, we use dummy variable $UNDRR$ that equals 1 if the bond's underwriter is in the top five underwriting score ranking, but 0 otherwise. In Panel B, we directly use the net underwriting score, which is calculated based on underwriting amount and number by the M–W system. The control variables and returns are winsorized at the 1st and 99th percentiles. ***, **, and * indicate that the parameter estimation is significantly different from 0 at the 1%, 5%, and 10% levels, respectively.

The coefficient on the interaction $POST \times SOE$, captures the differential impact of SOE before and after the default event. The results for both $Credit\ spreads$ and $Credit\ rating$ are presented in panels A and B of *Table 8*. In Panel A, we used the dummy variable $UNDRR$. In Panel B, we directly used the net underwriting scores. Both specifications in panels A and B indicate that bonds with state-owned ownership and higher underwriting ranking exhibit significantly lower $Credit\ spreads$ and higher $Credit\ rating$. In Panel A, the coefficient (-0.659, with a t-value of -2.35 in $Credit\ spreads$ regressions; 0.374, with a t-value of 1.88 in $Credit\ rating$ regressions) of the $POST \times SOE$ interaction indicates that, after the default, the correlations between SOE and $Credit\ spreads$ and $Credit\ rating$ become more significant. Meanwhile, the coefficient (0.419, with a t-value of 1.84 in $Credit\ spreads$ regressions; -0.182, with a t-value of -0.98 in $Credit\ rating$ regressions) of the $POST \times UNDERR$ interaction indicates that, after the default, the correlations between $UNDERR$ and $Credit\ spreads$ and $Credit\ rating$ become less significant.

The default event breaks the implicit guarantee expectation, and a new rigid payment expectation arises. Though a certain amount of bonds defaulted, most are eventually redeemed. The investors still have confidence in the political powers, and thus exhibit rigid payment expectations.

These findings are consistent with the prediction that SOE issuers are preferred by investors and rating agencies, especially after the default occurred. Further, the underwriters' reputation effect weakens. Although defaults are allowed nowadays, China's bond market is still far from well-functioning. We also included the above financial variables simultaneously in the main regressions in the interaction analysis.

4.3 Robustness tests

Using principal component analysis than financial indicators

Here, we used PCA to test the robustness of the regression results, than using direct financial indicators. We used financial data two quarters prior to the issuance as credit spreads are more affected by past financial information. This could alleviate any potential endogeneity concern. Table 9 and Table 10 present the regression estimates of $Credit\ spreads$ and $Credit\ rating$ on SOE, $UNDRR$, and the control variables before and after the first default occurred with subsample analysis and interaction analysis, respectively. As observed from these tables, the regression results are still robust. The empirical results are shown in Table 9 and Table 10.

Table 9. Robustness tests 1: subsample results by using the principal component analysis

Panel A: Dummies for TOP 5 of Net UNDRR Score: Credit spreads and Credit rating				
	(1)	(2)	(3)	(4)
	2008-2014.3.4	2014.3.4-2015	2008-2014.3.4	2014.3.4-2015
Variables	Credit spreads	Credit spreads	Credit rating	Credit rating
SOE	-0.322**	-1.690***	0.247***	1.161***
	(-2.56)	(-4.55)	(2.86)	(6.40)
UNDRR	-0.187*	0.165	0.227**	-0.420*
	(-1.83)	(0.65)	(2.34)	(-1.80)
Credit rating	-0.521***	-0.390*		
	(-6.11)	(-1.70)		
Collateral	0.073	0.471	0.400***	0.807***
	(0.62)	(1.60)	(4.16)	(4.64)
Option	-0.108	-0.169	-0.122	-0.035
	(-0.90)	(-0.97)	(-1.35)	(-0.17)
Auditor	-0.172	0.189	0.067	0.367*
	(-1.59)	(0.73)	(0.70)	(1.77)
Term	-0.258	0.357	-0.008	0.007
	(-1.52)	(1.22)	(-0.07)	(0.03)
Log(Bondterm)	-0.313***	0.079	0.439***	0.036
	(-3.87)	(0.55)	(6.30)	(0.31)
Log(Bondsize)	0.000	-0.000*	0.000***	0.000***
	(0.56)	(-1.84)	(3.82)	(2.74)
Short-term solvency factor	-1.127	-1.096	-0.468	1.076
	(-1.24)	(-0.36)	(-0.45)	(0.43)
Long-term profitability factor	-0.217	-3.052**	0.709*	2.923***
	(-0.54)	(-2.33)	(1.90)	(3.22)
Short -term profitability factor	-0.090	-0.521	0.049	1.025**
	(-0.83)	(-0.96)	(0.66)	(2.60)

Panel A: Dummies for TOP 5 of Net UNDRR Score: Credit spreads and Credit rating				
Liquidity capacity factor	0.478	-0.200	-0.832***	0.268
	(1.55)	(-0.29)	(-3.39)	(0.42)
Profitability factor	-1.711	-2.188	0.576	-3.638
	(-0.88)	(-0.47)	(0.39)	(-1.14)
Operational factor	0.522	-1.747	0.528	-1.509*
	(0.57)	(-1.45)	(0.73)	(-1.84)
GDP	-0.000	-0.000	0.000***	-0.000
	(-0.18)	(-0.95)	(3.02)	(-0.81)
LTD	-0.000	-0.001	-0.000	0.007*
	(-0.27)	(-0.13)	(-0.33)	(1.67)
Constant	6.405***	4.744***	2.116***	1.063*
	(13.09)	(5.58)	(6.59)	(1.70)
Time dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Observations	253	76	255	76
R-squared	0.589	0.843	0.631	0.745
Adjust R-squared	0.527	0.750	0.578	0.601
Panel B: Net UNDRR Score: Credit spreads and Credit rating				
	(1)	(2)	(3)	(4)
	2008-2014.3.4	2014.3.4-2015	2008-2014.3.4	2014.3.4-2015
Variables	Credit spreads	Credit spreads	Credit rating	Credit rating
SOE	-0.347***	-1.708***	0.273***	1.079***
	(-2.73)	(-5.01)	(3.06)	(5.42)
UNDRR_SCORE	-1.472***	3.219	1.421**	-1.411
	(-2.63)	(1.13)	(2.12)	(-0.37)
Credit rating	-0.517***	-0.402*		
	(-6.00)	(-1.85)		
Collateral	0.073	0.489*	0.395***	0.739***
	(0.63)	(1.73)	(4.09)	(3.97)
Option	-0.088	-0.152	-0.144	-0.052
	(-0.73)	(-0.87)	(-1.59)	(-0.23)
Auditor	-0.170	0.220	0.064	0.429**
	(-1.59)	(0.83)	(0.68)	(2.16)
Log(Bondterm)	-0.292*	0.357	0.028	0.051
	(-1.68)	(1.20)	(0.21)	(0.20)
Log(Bondsize)	-0.319***	0.074	0.444***	0.051
	(-3.94)	(0.52)	(6.62)	(0.42)
Totalasset	0.000	-0.000*	0.000***	0.000***
	(0.88)	(-1.94)	(3.80)	(2.68)
Short-term solvency factor	-1.196	-1.088	-0.389	1.302
	-0.347***	-1.708***	0.273***	1.079***

Panel B: Net UNDRR Score: Credit spreads and Credit rating				
Long-term profitability factor	-0.238	-3.161***	0.731**	2.264**
	(-0.60)	(-2.78)	(1.99)	(2.26)
Short –term profitability factor	-0.103	-0.570	0.067	0.748*
	(-0.96)	(-1.16)	(0.95)	(1.87)
Liquidity capacity factor	0.433	-0.225	-0.769***	0.133
	(1.42)	(-0.34)	(-3.14)	(0.22)
Profitability factor	-1.341	-1.887	0.159	-3.105
	(-0.68)	(-0.41)	(0.11)	(-0.98)
Operational factor	0.480	-1.830	0.586	-1.572*
	(0.52)	(-1.55)	(0.81)	(-1.87)
GDP	-0.000	-0.000	0.000***	-0.000
	(-0.41)	(-0.92)	(3.28)	(-0.58)
LTD	-0.000	-0.001	-0.000	0.007
	(-0.43)	(-0.19)	(-0.19)	(1.55)
Constant	6.613***	4.780***	1.905***	0.929
	(13.47)	(5.68)	(5.55)	(1.44)
Time dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Observations	253	76	255	76
R-squared	0.592	0.846	0.630	0.729
Adjust R-squared	0.531	0.754	0.576	0.577

Note: We use the principal component analysis instead of financial indicators. This table presents regression estimations of corporate bonds' $Credit\ spreads$ and $Credit\ rating$ on SOE and $UNDRR$ before and after the first default event occurred on March 4, 2014. In Panel A, we use dummy variable $UNDRR$ that equals 1 if the bond's underwriter is in the top five underwriting score ranking, but 0 otherwise. In Panel B, we directly use the net underwriting score, which is calculated based on the underwriting amount and number by the M–W system. The control variables and returns are winsorized at the 1st and 99th percentiles. ***, **, and * indicate that the parameter estimation is significantly different from 0 at the 1%, 5%, and 10% levels, respectively.

Table 10. Robustness tests 2: interaction analysis for the overall sample using the principal component analysis

	Panel A: Dummies for TOP 5 of Net UNDRR Score: Credit spreads and Credit rating		Panel B: Net UNDRR Score: Credit spreads and Credit rating	
	(1)	(2)	(3)	(4)
	Full	Full	Full	Full
Variables	Credit spreads	Credit rating	Credit spreads	Credit rating
SOE	-0.375***	0.235***	-0.393***	0.245***
	(-3.15)	(2.72)	(-3.23)	(2.79)
UNDRR	-0.241**	0.242***	-1.403***	1.279*
	(-2.17)	(2.66)	(-2.87)	(1.91)
POST	-0.449	-0.050	-0.564*	0.198
	(-1.48)	(-0.17)	(-1.68)	(0.57)
POST×SOE	-0.733***	0.337*	-0.662***	0.356
	(-3.01)	(1.72)	(-2.62)	(1.60)
POST×UNDRR	0.268	-0.115	-0.576	-2.103
	(1.23)	(-0.61)	(-0.23)	(-0.84)
Credit rating	-0.540***		-0.548***	
	(-6.61)		(-6.75)	
Collateral	0.156	0.450***	0.175	0.429***
	(1.41)	(5.33)	(1.61)	(5.01)
Option	-0.142	-0.153*	-0.150	-0.154*
	(-1.34)	(-1.70)	(-1.42)	(-1.74)
Auditor	-0.131	0.140	-0.111	0.120
	(-1.26)	(1.55)	(-1.07)	(1.29)
Log(Bondterm)	-0.193	0.039	-0.192	0.020
	(-1.31)	(0.29)	(-1.30)	(0.15)

In *Table 9*, columns (1) and (3) still show that bonds with state-owned ownership and higher underwriter ranking exhibit significantly lower $Credit\ spreads$ and higher $Credit\ rating$. Columns (2) and (4) show similar correlations. In Panel A, the

coefficient of SOE for the prior-default subsample (column 1) is significantly negative (-0.322, with a t-value of -2.56). For the after-default subsample (column 2), the negative correlation is pronounced. The coefficient of SOE is -1.690, with a t-value of -4.55, which confirms ***Hypothesis 2(a)***. In $Credit\ rating$ regressions, the coefficient of SOE for the prior-default subsample (column 3) is significantly positive (0.247, with a t-value of 2.86). For the after-default subsample (column 4), the positive correlation is pronounced. The coefficient of SOE is 1.161, with a t-value of 6.40, which confirms ***Hypothesis 2(b)***. The coefficient of $UNDERR$ for the prior-default subsample (column 1) is significantly negative (-0.187, with a t-value of -1.83). For the after-default subsample (column 2), the correlation weakens and reverses. The coefficient of $UNDERR$ is 0.165, with a t-value of 0.65, which confirms ***Hypothesis 3(a)***. The coefficient of $UNDERR$ for the prior-default subsample (column 3) is significantly positive (0.227, with a t-value of 2.34). For the after-default subsample (column 4), the positive correlation reverses. The coefficient of $UNDERR$ is -0.420, with a t-value of -1.80, which confirms ***Hypothesis 3(b)***.

In Panel B, the coefficient of SOE for the prior-default subsample (column 1) is significantly negative (-0.347, with a t-value of -2.73). For the after-default subsample (column 2), the negative correlation is pronounced. The coefficient of SOE is -1.708, with a t-value of -5.01. In $Credit\ rating$ regressions, the coefficient of SOE for the prior-default subsample (column 3) is significantly positive (0.273, with a t-value of 3.06). For the after-default subsample (column 4), the positive correlation is pronounced. The coefficient of SOE is 1.079, with a t-value of 5.42, which confirms ***Hypothesis 2(b)***. The coefficient of $UNDERR$ for the prior-default subsample (column 1) is also significantly negative (-1.472, with a t-value of -2.63). The coefficient of $UNDERR$ is not significantly different from 0 for the after-default subsample (column 2). The negative correlation weakens. In $Credit\ rating$ regressions, the coefficients of $UNDERR$ are almost the same as above.

In *Table 10*, the coefficients on the interaction $POST \times SOE$ are significant (-0.733, with a t-value of -3.01 of $Credit\ spreads$ regressions in Panel A; -0.662, with a t-value of -2.62 of $Credit\ spreads$ regressions in Panel B). However, they are not highly significant in $Credit\ rating$ regressions. The coefficient of the interaction $POST \times UNDERR$ indicates that the correlations between $UNDERR$ and $Credit\ spreads$ and $Credit\ rating$ are insignificant.

Using more financial indicators

We used more financial indicators, than using the representative four financial controls. Table 11 and Table 12 present the regression estimates of $Credit\ spreads$ and $Credit\ rating$ on SOE, $UNDRR$, and the control variables before and after the first default occurred with subsample analysis and interaction analysis, respectively. The main regression results are still robust. The empirical results are shown in Table 11 and Table 12.

Table 11. Robustness tests 3: subsample results by using more financial indicators

Panel A: Dummies for TOP 5 of Net UNDRR Score: Credit spreads and Credit rating				
	(1)	(2)	(3)	(4)
	2008-2014.3.4	2014.3.4-2015	2008-2014.3.4	2014.3.4-2015
Variables	Credit spreads	Credit spreads	Credit rating	Credit rating
SOE	-0.431**	-0.828***	0.023	0.675**
	(-1.99)	(-46.09)	(0.19)	(2.12)
UNDRR	-0.323	1.247***	0.205	0.228
	(-1.46)	(24.01)	(1.04)	(0.22)
Credit rating	-0.474***	-2.348***		
	(-2.94)	(-101.53)		
Collateral	0.288	1.945***	0.341**	0.249
	(1.47)	(83.35)	(2.57)	(0.34)
Option	-0.109	-1.423***	-0.072	-0.833
	(-0.46)	(-38.52)	(-0.39)	(-1.09)
Auditor	0.036	-0.212***	-0.031	-0.186
	(0.20)	(-11.91)	(-0.23)	(-0.26)
Log(Bondterm)	-0.219	3.094***	-0.053	1.865
	(-0.76)	(40.74)	(-0.24)	(0.93)
Log(Bondsize)	-0.282**	-1.419***	0.315**	-1.650
	(-2.01)	(-26.87)	(2.10)	(-1.40)
Total asset	0.000	0.000***	0.000***	0.000
	(0.51)	(46.53)	(3.08)	(1.39)
Liquidity	0.001***	-0.015***	-0.001**	-0.007
	(2.76)	(-67.99)	(-2.52)	(-1.46)
Cash ratio	-0.003	-0.019***	0.000	-0.014
	(-0.54)	(-17.93)	(0.02)	(-0.32)
Asset-liability ratio	-0.004	0.130***	-0.009	0.033
	(-0.38)	(72.32)	(-1.32)	(0.96)
Panel A: Dummies for TOP 5 of Net UNDRR Score: Credit spreads and Credit rating				
EBITDA	0.001	0.032***	-0.002*	0.010
	(0.48)	(31.13)	(-1.83)	(0.29)
ROE	0.043	-0.726***	-0.005	-0.231
	(0.93)	(-73.75)	(-0.19)	(-1.20)
ROA	-0.160*	1.384***	0.027	0.391
	(-1.69)	(60.04)	(0.47)	(0.79)
Total assets turnover rate	-0.004	0.029***	0.002	0.016
	(-1.31)	(26.69)	(0.96)	(0.42)
Net profit growth rate	-0.000	-0.003***	-0.000	-0.003**
	(-1.42)	(-43.67)	(-1.02)	(-2.26)
Net assets growth rate	-0.010*	0.018***	-0.007**	-0.007
	(-1.75)	(53.25)	(-2.01)	(-0.91)
Long-term solvency	-0.006	0.214***	0.006	0.116
	(-0.79)	(64.02)	(1.16)	(1.03)
Sales cash ratio	0.000	-0.000***	0.000	-0.000
	(0.19)	(-29.57)	(0.02)	(-0.93)
Profitability	0.002	-0.105***	-0.016	-0.051***
	(0.20)	(-82.00)	(-1.65)	(-4.27)
GDP	0.000	-0.000***	0.000	0.000**
	(0.47)	(-14.73)	(1.49)	(2.71)
LTD	-0.001	0.015***	-0.001	-0.014
	(-0.73)	(11.99)	(-0.46)	(-0.31)
Constant	9.058***	1.768***	2.974***	3.383
	(5.77)	(10.26)	(3.00)	(0.98)
Time dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Observations	125	33	125	33
R-squared	0.628	1.000	0.687	0.976
Adjust R-squared	0.475	1.000	0.564	0.617
Panel B: Net UNDRR Score: Credit spreads and Credit rating				
	(1)	(2)	(3)	(4)
	2008-2014.3.4	2014.3.4-2015	2008-2014.3.4	2014.3.4-2015
Variables	Credit spreads	Credit spreads	Credit rating	Credit rating
SOE	-0.446**	-0.719***	0.029	0.626
	(-2.08)	(-2.87)	(0.24)	(1.68)
UNDRR_SCORE	-3.765**	8.241**	1.975	3.697
	(-2.17)	(2.13)	(1.15)	(0.38)
Credit rating	-0.461***	-2.462***		
	(-2.89)	(-7.27)		
Collateral	0.258	2.004***	0.352***	0.316
	(1.31)	(5.85)	(2.64)	(0.36)

Panel B: Net UNDRR Score: Credit spreads and Credit rating				
Option	-0.119	-1.413***	-0.072	-0.683
	(-0.51)	(-2.80)	(-0.39)	(-0.77)
Auditor	0.061	-0.249	-0.046	-0.066
	(0.34)	(-0.94)	(-0.34)	(-0.08)
Log(Bondterm)	-0.235	2.398**	-0.043	1.664
	(-0.80)	(2.29)	(-0.20)	(0.89)
Log(Bondsize)	-0.288**	-0.892	0.319**	-1.504
	(-2.03)	(-1.22)	(2.16)	(-1.47)
Total asset	0.000	0.000***	0.000***	0.000
	(0.57)	(3.19)	(3.03)	(1.49)
Liquidity	0.001***	-0.012***	-0.001**	-0.006
	(2.75)	(-3.64)	(-2.59)	(-0.87)
Cash ratio	-0.003	-0.014	-0.000	-0.006
	(-0.51)	(-0.87)	(-0.01)	(-0.11)
Asset liability	-0.005	0.104***	-0.009	0.029
	(-0.49)	(4.30)	(-1.19)	(1.00)
EBITDA	0.000	0.016	-0.002*	0.005
	(0.40)	(1.12)	(-1.76)	(0.10)
ROE	0.046	-0.586***	-0.007	-0.208*
	(1.00)	(-4.59)	(-0.26)	(-1.71)
ROA	-0.164*	1.127***	0.029	0.384
	(-1.74)	(5.41)	(0.50)	(1.12)
Total assets turnover	-0.004	0.024**	0.002	0.017
	(-1.35)	(2.41)	(0.98)	(0.42)
Net profit growth	-0.000	-0.003*	-0.000	-0.003
	(-1.20)	(-1.94)	(-1.30)	(-1.56)
Net assets growth	-0.009*	0.019**	-0.007**	-0.005
	(-1.67)	(2.47)	(-2.05)	(-0.51)
Long-term solvency	-0.007	0.186***	0.006	0.093
	(-0.89)	(3.50)	(1.25)	(0.56)
Sales cash ratio	0.000	-0.000	-0.000	-0.000
	(0.18)	(-1.34)	(-0.02)	(-1.07)
Profitability	0.003	-0.095***	-0.016*	-0.047**
	(0.27)	(-5.10)	(-1.66)	(-2.61)
GDP	0.000	-0.000*	0.000*	0.000
	(0.33)	(-1.73)	(1.83)	(1.61)
LTD	-0.002	0.005	-0.001	-0.017
	(-0.84)	(0.58)	(-0.40)	(-0.32)
Constant	8.998***	3.899**	3.020***	3.299
	(5.71)	(2.46)	(3.08)	(1.09)
Time dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Observations	125	33	125	33
R-squared	0.633	0.998	0.688	0.978
Adjust R-squared	0.483	0.942	0.566	0.653

Note: For robustness tests, we use more financial indicators. This table presents regression estimations of corporate bonds' $Credit\ spreads$ and $Credit\ rating$ on SOE and $UNDRR$ before and after the first default event occurred on March 4, 2014. In Panel A, we use dummy variable $UNDRR$ that equals to 1 if the bond's underwriter is in the top five underwriting score ranking, but 0 otherwise. In Panel B, we directly use the net underwriting score, which is calculated based on underwriting amount and number by the M–W system. The control variables and returns are winsorized at the 1st and 99th percentiles. ***, **, and * indicate that the parameter estimation is significantly different from 0 at the 1%, 5%, and 10% levels, respectively.

Columns (1) and (3) still show that bonds with state-owned ownership and higher underwriter ranking exhibit significantly lower $Credit\ spreads$ and higher $Credit\ rating$. Columns (2) and (4) show similar correlations. In Panel A, the coefficient of SOE for the prior-default subsample (column 1) is significantly negative (-0.431, with a t-value of -1.99). For the after-default subsample (column 2), the negative correlation is pronounced. In Panel B, the coefficient of SOE for the prior-default subsample (column 1) is significantly negative (-0.446, with a t-value of -2.08). For the after-default subsample (column 2), the negative correlation is pronounced. The coefficient of SOE is -0.719, with a t-value of -2.87. The coefficients of SOE in $Credit\ rating$ regressions are insignificant. The coefficient of $UNDERR$ for the prior-default subsample (column 1) is also significantly

negative (-3.765, with a t-value of -2.17). The coefficients of $UNDERR$ are not significantly different from 0 in $Credit\ rating$ regressions.

In *Table 12*, the coefficients on the interaction $POST \times SOE$ are significant (-0.844, with a t-value of -2.57 of $Credit\ spreads$ regressions in Panel A; -0.858, with a t-value of -2.29 of $Credit\ spreads$ regressions in Panel B). However, they are insignificant in $Credit\ rating$ regressions. The coefficient of the interaction $POST \times UNDERR$ indicates that the correlations between $UNDERR$ and $Credit\ spreads$ and $Credit\ rating$ are insignificant.

Thus, when we included more financial controls, some coefficients related to $UNDERR$ became less significant, while the coefficients related to SOE remained robust.

Table 12. Robustness tests 4: interaction analysis by using more financial indicators

	Panel A: Dummies for TOP 5 of Net UNDRR Score: Credit spreads and Credit rating		Panel B: Net UNDRR Score: Credit spreads and Credit rating	
	(1)	(2)	(3)	(4)
Variables	Full Credit spreads	Full Credit rating	Full Credit spreads	Full Credit rating
SOE	-0.392**	0.028	-0.419**	0.067
	(-2.02)	(0.22)	(-2.09)	(0.57)
UNDRR	-0.255	0.221*	-2.907*	2.177
	(-1.39)	(1.77)	(-1.75)	(1.26)
POST	-1.723**	0.176	-1.752**	0.107
	(-2.60)	(0.37)	(-2.54)	(0.22)
POST×SOE	-0.844**	0.282	-0.858**	0.206
	(-2.57)	(1.06)	(-2.29)	(0.77)
POST×UNDRR	0.355	-0.434*	4.233	-1.752
	(0.85)	(-1.73)	(0.93)	(-0.62)
Credit rating	-0.520***		-0.531***	
	(-3.60)		(-3.65)	
Collateral	0.289	0.414***	0.303*	0.410***
	(1.50)	(3.12)	(1.75)	(3.31)
Option	-0.103	-0.200	-0.152	-0.139
	(-0.50)	(-1.33)	(-0.74)	(-0.89)
Auditor	0.061	-0.009	0.116	-0.062
	(0.35)	(-0.08)	(0.70)	(-0.49)
Log(Bondterm)	-0.270	-0.056	-0.216	-0.123
	(-1.04)	(-0.28)	(-0.84)	(-0.64)
Log(Bondsize)	-0.207*	0.279*	-0.233*	0.306**
	(-1.67)	(1.95)	(-1.81)	(2.15)
Total asset	0.000	0.000***	0.000	0.000***
	(0.63)	(2.88)	(0.82)	(2.89)
Liquidity	0.002***	-0.001***	0.002***	-0.001***
	(2.84)	(-3.01)	(2.86)	(-3.09)

	Panel A: Dummies for TOP 5 of Net UNDRR Score: Credit spreads and Credit rating		Panel B: Net UNDRR Score: Credit spreads and Credit rating	
	(1)	(2)	(3)	(4)
Variables	Full Credit spreads	Full Credit rating	Full Credit spreads	Full Credit rating
Cash ratio	-0.004	0.003	-0.005	0.003
	(-0.84)	(0.60)	(-0.95)	(0.63)
Asset-liability ratio	-0.001	-0.012*	-0.001	-0.011
	(-0.09)	(-1.71)	(-0.10)	(-1.57)
EBITDA	0.001	-0.001	0.000	-0.001
	(0.56)	(-1.47)	(0.39)	(-1.33)
ROE	0.040	-0.017	0.037	-0.017
	(1.09)	(-0.64)	(1.03)	(-0.67)
ROA	-0.153*	0.028	-0.148*	0.029
	(-1.87)	(0.46)	(-1.91)	(0.50)
Total assets turnover rate	-0.003	0.002	-0.003	0.003
	(-0.81)	(1.15)	(-1.09)	(1.31)
Net profit growth rate	-0.000	-0.000	-0.000	-0.000
	(-0.86)	(-1.13)	(-1.05)	(-0.91)
Net assets growth rate	-0.007**	-0.006*	-0.007**	-0.006*
	(-2.23)	(-1.94)	(-2.17)	(-1.77)
Long-term solvency	-0.002	0.004	-0.002	0.004
	(-0.29)	(0.92)	(-0.26)	(0.87)
Sales cash ratio	0.000	-0.000	0.000	-0.000
	(0.87)	(-1.07)	(0.49)	(-0.65)
Profitability	-0.006	-0.008	-0.006	-0.007
	(-0.96)	(-1.20)	(-0.95)	(-1.14)
GDP	-0.000	0.000	-0.000	0.000
	(-0.72)	(1.36)	(-0.61)	(1.34)
LTD	-0.000	-0.000	-0.001	-0.000
	(-0.25)	(-0.28)	(-0.52)	(-0.03)
Constant	7.630***	2.259***	7.678***	2.293***
	(6.45)	(3.00)	(6.27)	(3.07)
Time dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Observations	158	158	158	158
R-squared	0.651	0.643	0.651	0.636
Adjust R-squared	0.523	0.516	0.523	0.507

Note: For robustness tests, we use financial indicators instead of the principal component analysis. This table presents interaction analysis for the overall sample regression. $Post$ is an indicator variable that equals 1 if the bond is issued after the first bond default event, but 0 otherwise. In Panel A, we use dummy variable $UNDRR$ that equals to 1 if the bond's underwriter is in the top five underwriting score ranking, but 0 otherwise. In Panel B, we directly use the net underwriting score, which is calculated based on underwriting amount and number by the M–W system. The control variables and returns are winsorized at the 1st and 99th percentiles. ***, **, and * indicate that the parameter estimation is significantly different from 0 at the 1%, 5%, and 10% levels, respectively.

Using one-year prior financial indicators

We used one-year prior financial indicators, than using the two quarters prior financial indicators by PCA methods. Table 13 and Table 14 present the regression estimates of $Credit\ spreads$ and $Credit\ rating$ on SOE, $UNDRR$, and the control variables before and after the first default occurred with subsample analysis and interaction analysis, respectively. The main regression results are still robust. The empirical results are shown in Table 13 and Table 14.

Table 13. Robustness tests 5: subsample results by using one-year prior financial indicators

Panel A: Dummies for TOP 5 of Net UNDRR Score: Credit spreads and Credit rating				
	(1)	(2)	(3)	(4)
	2008-2014.3.4	2014.3.4-2015	2008-2014.3.4	2014.3.4-2015
Variables	Credit spreads	Credit spreads	Credit rating	Credit rating
SOE	-0.327**	-1.188***	0.237***	0.706***
	(-2.50)	(-4.81)	(2.65)	(3.60)
UNDRR	-0.178*	-0.317**	0.205**	-0.019
	(-1.72)	(-2.03)	(2.21)	(-0.07)
Credit rating	-0.544***	-0.612***		
	(-6.25)	(-3.94)		
Collateral	0.092	0.867***	0.445***	0.590***
	(0.72)	(3.83)	(4.37)	(3.11)
Option	-0.110	-0.214	-0.083	-0.122
	(-0.92)	(-1.05)	(-0.91)	(-0.50)
Auditor	-0.147	0.073	0.056	0.381*
	(-1.31)	(0.30)	(0.63)	(1.95)
Log(Bondterm)	-0.229	0.240	-0.097	0.142
	(-1.35)	(0.88)	(-0.72)	(0.46)
Log(Bondsize)	-0.290***	0.239	0.409***	-0.074
	(-3.71)	(1.24)	(6.03)	(-0.47)
Total asset	0.000	-0.000	0.000***	0.000**
	(1.02)	(-0.05)	(3.84)	(2.47)
Liquidity	-0.000	-0.000	-0.001*	-0.001
	(-0.74)	(-0.03)	(-1.77)	(-1.06)
ROA	0.000	-0.060*	0.044**	0.005
	(0.03)	(-1.70)	(2.28)	(0.10)
Asset-liability ratio	-0.000	-0.001	-0.004	-0.014
	(-0.06)	(-0.13)	(-0.92)	(-1.58)
Long-term solvency	-0.005	-0.021***	-0.002	0.002
	(-1.25)	(-2.74)	(-0.60)	(0.32)
GDP	-0.000	-0.000*	0.000***	-0.000
	(-0.24)	(-1.91)	(2.65)	(-0.53)
LTD	-0.000	-0.000	-0.000	0.004
	(-0.33)	(-0.05)	(-0.05)	(0.83)
Constant	6.477***	5.383***	2.682***	2.203**
	(9.98)	(5.43)	(5.78)	(2.31)
Time dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Observations	249	76	251	76
R-squared	0.580	0.817	0.607	0.663
Adjust R-squared	0.523	0.721	0.555	0.494
Panel B: Net UNDRR Score: Credit spreads and Credit rating				
	(1)	(2)	(3)	(4)
	2008-2014.3.4	2014.3.4-2015	2008-2014.3.4	2014.3.4-2015
Variables	Credit spreads	Credit spreads	Credit rating	Credit rating
SOE	-0.348***	-1.229***	0.257***	0.689***
	(-2.65)	(-4.76)	(2.81)	(3.51)
UNDRR_SCORE	-1.443**	-0.651	1.268**	0.935
	(-2.60)	(-0.27)	(2.04)	(0.32)
Credit rating	-0.540***	-0.608***		
	(-6.17)	(-3.71)		
Collateral	0.090	0.865***	0.442***	0.595***
	(0.72)	(3.57)	(4.34)	(3.20)

Panel B: Net UNDRR Score: Credit spreads and Credit rating				
Option	-0.088	-0.204	-0.104	-0.116
	(-0.73)	(-1.00)	(-1.15)	(-0.47)
Auditor	-0.146	0.119	0.057	0.398**
	(-1.32)	(0.48)	(0.65)	(2.12)
Log(Bondterm)	-0.264	0.265	-0.061	0.150
	(-1.53)	(0.93)	(-0.45)	(0.48)
Log(Bondsize)	-0.298***	0.253	0.417***	-0.072
	(-3.80)	(1.30)	(6.39)	(-0.46)
Total asset	0.000	0.000	0.000***	0.000**
	(1.41)	(0.08)	(3.75)	(2.46)
Liquidity	-0.000	-0.000	-0.001*	-0.001
	(-0.76)	(-0.04)	(-1.67)	(-1.04)
ROA	0.002	-0.058	0.043**	0.005
	(0.14)	(-1.61)	(2.22)	(0.10)
Asset-liability ratio	-0.000	-0.001	-0.004	-0.014
	(-0.05)	(-0.14)	(-0.84)	(-1.59)
Long-term solvency	-0.005	-0.020**	-0.002	0.003
	(-1.34)	(-2.61)	(-0.50)	(0.37)
GDP	-0.000	-0.000*	0.000***	-0.000
	(-0.45)	(-1.68)	(2.89)	(-0.50)
LTD	-0.000	-0.000	0.000	0.003
	(-0.48)	(-0.02)	(0.08)	(0.78)
Constant	6.682***	5.242***	2.470***	2.169**
	(10.62)	(5.12)	(5.09)	(2.23)
Time dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Observations	249	76	251	76
R-squared	0.583	0.812	0.606	0.663
Adjust R-squared	0.526	0.712	0.554	0.495

Note: This table presents regression estimates of corporate bonds' $Credit\ spreads$ and $Credit\ rating$ on SOE and $UNDRR$ before and after the first default event occurred on March 4, 2014. In Panel A, we use dummy variable $UNDRR$ that equals to 1 if the bond's underwriter is in the top five underwriting score ranking, but 0 otherwise. In Panel B, we directly use the net underwriting score, which is calculated based on the underwriting amount and number by the M–W system. We include financial controls one year prior instead of two quarters prior in the regressions. The control variables and returns are winsorized at the 1st and 99th percentiles. All the standard errors are clustered in the regressions at the company and year level. ***, **, and * indicate that the parameter estimation is significantly different from 0 at the 1%, 5%, and 10% levels, respectively.

Columns (1) and (3) still show that bonds with state-owned ownership and higher underwriter ranking exhibit significantly lower $Credit\ spreads$ and higher $Credit\ rating$. Columns (2) and (4) show similar correlations. The results match the original results in the main regressions.

Table 14. Robustness tests 6: interaction analysis by using one-year prior financial indicators

	Panel A: Dummies for TOP 5 of Net UNDRR Score: Credit spreads and Credit rating		Panel B: Net UNDRR Score: Credit spreads and Credit rating	
	(1)	(2)	(3)	(4)
Variables	Full Credit spreads	Full Credit rating	Full Credit spreads	Full Credit rating
SOE	-0.366***	0.219**	-0.387***	0.230**
	(-2.98)	(2.48)	(-3.08)	(2.59)
UNDRR	-0.302***	0.251***	-1.478***	1.204**
	(-2.77)	(2.86)	(-3.03)	(1.98)
POST	-0.526	-0.053	-0.568	0.140
	(-1.63)	(-0.18)	(-1.59)	(0.39)
POST×SOE	-0.704**	0.413**	-0.587**	0.411*
	(-2.45)	(2.12)	(-1.99)	(1.83)
POST×UNDRR	0.416*	-0.197	-1.230	-1.826
	(1.78)	(-1.08)	(-0.43)	(-0.71)
Credit rating	-0.537***		-0.554***	
	(-6.38)		(-6.63)	
Collateral	0.162	0.466***	0.188*	0.446***
	(1.41)	(5.35)	(1.66)	(5.05)
Option	-0.154	-0.128	-0.169	-0.126
	(-1.51)	(-1.41)	(-1.64)	(-1.41)
Auditor	-0.123	0.152*	-0.090	0.125
	(-1.17)	(1.81)	(-0.86)	(1.48)
Log(Bondterm)	-0.225	0.015	-0.207	-0.013
	(-1.49)	(0.11)	(-1.37)	(-0.09)
Log(Bondsize)	-0.183**	0.283***	-0.225***	0.326***
	(-2.29)	(4.21)	(-2.91)	(5.03)
Total asset	0.000	0.000***	0.000	0.000***
	(0.91)	(4.06)	(1.25)	(3.83)
Liquidity	-0.000	-0.000	-0.000	-0.001
	(-0.40)	(-1.23)	(-0.33)	(-1.41)
ROA	-0.004	0.037**	-0.003	0.037**
	(-0.29)	(2.09)	(-0.22)	(2.10)
Asset-liability ratio	0.002	-0.004	0.002	-0.004
	(0.38)	(-0.89)	(0.44)	(-1.00)
Long-term solvency	-0.006	-0.000	-0.006	-0.000
	(-1.60)	(-0.10)	(-1.55)	(-0.11)
GDP	-0.000	0.000*	-0.000	0.000*
	(-1.34)	(1.76)	(-1.62)	(1.89)
LTD	-0.000	0.000	-0.000	0.000
	(-0.03)	(0.23)	(-0.22)	(0.33)
Constant	6.035***	2.006***	6.212***	1.865***
	(11.33)	(4.06)	(11.72)	(3.64)
Time dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Observations	325	327	325	327
R-squared	0.620	0.566	0.615	0.559
Adjust R-squared	0.573	0.514	0.567	0.506

Note: This table presents regression estimates of corporate bonds' $Credit\ spreads$ and $Credit\ rating$ on SOE and $UNDRR$ before and after the first default event occurred on March 4, 2014. In Panel A, we use dummy variable $UNDRR$ that equals to 1 if the bond's underwriter is in the top five underwriting score ranking, but 0 otherwise. In Panel B, we directly use the net underwriting score, which is calculated based on the underwriting amount and number by the M–W system. We include financial controls one year prior instead of two quarters prior in the regressions. The control variables and returns are winsorized at the 1st and 99th percentiles. All the standard errors are clustered in the regressions at the company and year level. ***, **, and * indicate that the parameter estimation is significantly different from 0 at the 1%, 5%, and 10% levels, respectively.

Endogeneity concern

We used underwriting information of the year prior to issuance to calculate underwriting scores and rankings. We also used financial data prior to issuance to determine any potential endogeneity concern. The correlations between the underwriter's reputation and credit spreads and rating may still suffer from an endogeneity problem, as the choice of reputable underwriters may not be an exogenous event. Particularly, this concern arises because firms that hire reputable underwriters may be of higher quality. Thus, endogeneity may not be properly controlled in the regressions. There could be additional unmeasured effects affecting the choice of reputable leading underwriters and bond spreads. This may lead to an omitted variable bias.

To address this endogeneity concern, we employed a two-stage least squares (2SLS) approach (Chen, Shi, and Xu 2013). Particularly, in the first stage, we estimated a probit underwriter choice model. The *ex-ante* likelihood of choosing a reputable underwriter, denoted by $UNDRR$, is regressed on a set of variables that are deemed to affect the choice—

$$UNDRR_i = \gamma_0 + \gamma_i UNDRR_{ownership_i} + \gamma_3 FIN_i + \gamma_4 BOND_i + \gamma_5 OTHERCONTROLS_i + TimeDummies + IndustryDummies + \varepsilon, \quad (5)$$

where $UNDRR$ is a dummy variable that equals 1 if the market share (calculated by amount and number in M–W ranking system) of a specific underwriter in the year prior to the issuance is in the *TOP 5*, but 0 otherwise. $UNDRR\_ownership$ is used as the instrumental variable. It is a dummy variable that equals 1 if the underwriter is a state-owned company, but 0 otherwise (Chen and Xu 2011). The state-owned ownership of the underwriter is relevant to the underwriter's strategies in choosing bond issuers, and thus influences the credit spreads and rating. The ownership property of the underwriter is largely exogenous. The bond issuers' choices of underwriters do not affect the underwriters' ownerships but do affect their market shares. Therefore, we believe that $UNDRR\_ownership$ is a good candidate for the instrumental variable.

In the second stage, we empirically tested the correlations between credit spreads and credit rating, and underwriter reputation. We estimated the following regression by using $UNDRR$, the predicted value of equation (5), as the proxy for underwriter reputation and link with $Credit\ Spreads$ and $Credit\ Rating$—

$$Credit\ \ spreads_i = \alpha_1 SOE_i + \alpha_2 \hat{UNDRR}_i + \alpha_3 FIN_i + \alpha_4 BOND_i + \alpha_5 OTHERCONTROLS_i + Time\ \ dummies + Industry\ \ dummies + \varepsilon \quad (6)$$

$$Credit\ \ rating_i = \beta_1 SOE_i + \beta_2 \hat{UNDRR}_i + \beta_3 FIN_i + \beta_4 BOND_i + \beta_5 OTHERCONTROLS_i + Time\ \ dummies + Industry\ \ dummies + \varepsilon \quad (7)$$

We also included a set of control variables, with the expectation of a negative coefficient for $\widehat{UNDRR}_\iota$ in $Credit\ Spreads$ regressions and a positive coefficient in $Credit\ Rating$ regressions. According to the hypotheses, we expected a more significant negative coefficient for SOE than for $\widehat{UNDRR}_\iota$. The results of the 2SLS approach are reported in *Table 15*.

All *t*-statistics are clustering. We report the results before and after the first default event, while column 1 (2) reports the result of the first (second) stage. In the first-step regression in the prior-default period, the coefficient of $UNDRR\_ownership$ significantly correlates with $UNDRR$. Thus, before the default, issuers preferred to be underwritten by state-owned underwriters. Thus, state-owned underwriters have larger market shares. This may be the result of the underwriter's strategy according to Chen and Xu (2011), making our main results reasonable. Further, the underwriter effect is dominated by the issuer ownership effect, but significantly weakened after the default occurred. Regarding the results of the second-step regression in Panel A, although the coefficient of $UNDERR$ for the $Credit\ spreads$ before the default event (column 2) is not significant, the coefficient of $UNDERR$ (column 4) is more insignificant. This result conforms to the hypotheses. Besides, in Panel B, the coefficient of $UNDERR$ for the $Credit\ rating$ before the default event (column 2) is positive. Contrariwise, after the default event, the coefficient of $UNDERR$ (column 4) reverses. This result also conforms to the hypotheses.

Table 15. 2SLS Regressions on subsamples before and after the first default

Panel A: Dummies for TOP 5 of Net UNDRR Score: Credit spreads				
	Prior-default period		After-default period	
Variables	(1)1st Stage	(2)2nd Stage	(1)1st Stage	(2)2nd Stage
UNDERR		3.798		35.214
		(0.65)		(0.21)
UNDERR_ownership	-0.029**		-0.004	
	(-2.30)		(-0.20)	
SOE	0.008	-0.422**	0.019*	-1.896
	(0.71)	(-2.24)	(1.68)	(-0.60)
Credit rating	0.000	-0.585***	-0.000	-0.611*
	(0.03)	(-4.94)	(-0.05)	(-1.82)
Collateral	-0.014	0.247	-0.015	1.265
	(-1.06)	(1.38)	(-0.92)	(0.52)
Option	0.013	-0.229	0.001	-0.377
	(1.13)	(-1.52)	(0.06)	(-0.63)
Auditor	0.001	-0.051	-0.019	0.821
	(0.05)	(-0.33)	(-1.14)	(0.26)
Log(Bondterm)	-0.032*	-0.116	-0.007	0.528
	(-1.74)	(-0.38)	(-0.46)	(0.39)
Log(Bondsize)	0.010	-0.140	-0.002	0.423
	(0.94)	(-1.41)	(-0.25)	(1.02)
Total asset	0.000	-0.000	-0.000	-0.000
	(0.84)	(-0.44)	(-0.30)	(-0.24)
Liquidity	0.000	-0.001	-0.000	0.008
	(0.52)	(-1.63)	(-1.04)	(0.46)
ROA	0.003	-0.022	0.001	-0.097
	(1.47)	(-0.70)	(0.34)	(-0.79)
Asset-liability ratio	0.001	-0.002	-0.000	0.021
	(1.09)	(-0.22)	(-0.39)	(0.64)
Long-term solvency	-0.000	-0.010**	-0.001	0.024
	(-0.27)	(-2.20)	(-1.34)	(0.20)
GDP	-0.000	0.000	-0.000	0.000
	(-0.30)	(0.23)	(-0.84)	(0.11)

Panel A: Dummies for TOP 5 of Net UNDRR Score: Credit spreads				
	Prior default period		After default period	
Variables	(1)1st Stage	(2)2nd Stage	(1)1st Stage	(2)2nd Stage
LTD	-0.000	-0.000	0.000	0.001
	(-0.65)	(-0.14)	(0.32)	(0.07)
Constant	0.301***	4.398***	0.050	-0.798
	(2.69)	(2.59)	(1.10)	(-0.08)
Time dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Observations	149	148	53	53
R-squared	0.667	0.521	0.447	0.172
Adjust R-squared	0.586	0.404	0.00930	-0.485
Panel B: Dummies for TOP 5 of Net UNDRR Score: Credit rating				
	Prior default period		After default period	
Variables	(1)1st Stage	(2)2nd Stage	(1)1st Stage	(2)2nd Stage
UNDERR		1.240		-1.984
		(0.50)		(-0.28)
UNDERR_ownership	-0.029**		-0.004	
	(-2.30)		(-0.20)	
SOE	0.008	-0.453*	0.019*	-0.843
	(0.71)	(-1.83)	(1.68)	(-0.59)
Collateral	0.000	-0.609***	-0.000	-0.692***
	(0.03)	(-3.99)	(-0.05)	(-3.28)
Option	-0.014	0.234	-0.015	0.612
	(-1.06)	(1.11)	(-0.92)	(1.05)
Auditor	0.013	-0.090	0.001	-0.222
	(1.13)	(-0.32)	(0.06)	(-0.38)
Log(Bondterm)	0.001	-0.117	-0.019	-0.252
	(0.05)	(-0.44)	(-1.14)	(-0.18)
Log(Bondsize)	-0.032*	-0.256	-0.007	-0.264
	(-1.74)	(-0.81)	(-0.46)	(-0.14)
Total asset	0.010	-0.253	-0.002	0.109
	(0.94)	(-0.79)	(-0.25)	(0.13)
Liquidity	0.000	0.000	-0.000	-0.000
	(0.84)	(0.38)	(-0.30)	(-0.53)
ROA	0.000	-0.002	-0.000	0.005**
	(0.52)	(-1.06)	(-1.04)	(2.46)
Asset-liability ratio	0.003	-0.012	0.001	-0.060
	(1.47)	(-0.37)	(0.34)	(-0.87)
Long-term solvency	0.001	-0.008	-0.000	0.020
	(1.09)	(-0.45)	(-0.39)	(1.11)
GDP	-0.000	-0.013*	-0.001	-0.018
	(-0.27)	(-1.71)	(-1.34)	(-0.27)
LTD	-0.000	-0.000	-0.000	-0.000
	(-0.30)	(-0.46)	(-0.84)	(-0.42)
Constant	-0.000	-0.001	0.000	0.000
	(-0.65)	(-0.28)	(0.32)	(0.02)
Time dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Observations	149	148	53	53
R-squared	0.667	0.231	0.447	0.658
Adjust R-squared	0.586	0.0416	0.00930	0.387

Note: This table presents two-stage least squares estimates of corporate bonds' $Credit\ spreads$ (Panel A) and $Credit\ rating$ (Panel B) on SOE and $UNDRR$ before and after the first default event occurred on March 4, 2014. We only report the result of the dummy variable $UNDRR$ that equals to 1 if the bond's underwriter is in the top five underwriting score ranking, but 0 otherwise. The control variables are defined in *Table 1*. Directly using the net underwriting scores yields similar results. $UNDERR\_ownership$ equals to 1 if the underwriter is a state-owned company, but 0 otherwise. The control variables and returns are winsorized at the 1st and 99th percentiles. ***, **, and * indicate that the parameter estimation is significantly different from zero at the 1%, 5%, and 10% levels, respectively.

Further evidence from Propensity Score Matching (PSM) method

The Propensity Score Matching (PSM) method can solve the self-selection and sample bias problem. Though this method does not solve the endogeneity problem completely, and requires a large sample size, it is more appropriate for analyzing the impact of the default event on spreads and rating. Because each bond has only one observation on the issuance spreads and rating, we can observe how the treatment group (the companies issuing bonds after the first default) is affected by the default event. However, the status of these companies if they were not affected by the default event is not apparent due to the absence of observations. Therefore, this state is in line with the counter-fact framework.

The matching method can be used to construct the experimental environment to estimate the impact of default events. We divided the sample into two groups according to the occurrence of the first default event. The treatment group is the group of issuers after the first default event. The control group is the group of issuers before the first default event. By matching the treatment and control groups, the difference in bond spreads (ratings) between groups of issuers after and before the first default event is compared under the same conditions. By accurately matching the samples, we can judge the causal relationship between the default event and the bond spreads (rating). The propensity score is estimated based on the logit model through the sample firm's and bonds' characteristic data.

The estimation of the propensity score is the first step in the PSM method (Rosenbaum and Rubin 1983). The propensity score was calculated based on the logit model. To avoid the influence of industry factors on the results, we also included the industry dummies in this part. Further, to find the matching objects of the treatment group (sample after the occurrence of the first default event) from the control group (sample before the occurrence of the first default event) based on multidimensional matching, the covariates selected in this study are the financial indicators and bond characteristic indicators used above. The specific model is—

$$POST = \alpha_0 + \alpha_1 SOE_i + \alpha_2 UNDRR_i + \alpha_3 Creditrating_i + \alpha_4 FIN_i + \alpha_5 BOND_i + \alpha_6 OTHERCONTROLS_i + IndustryDummies + \varepsilon. \quad (8)$$

$$POST = \beta_0 + \beta_1 SOE_i + \beta_2 UNDRR_i + \beta_3 FIN_i + \beta_4 BOND_i + \beta_5 OTHERCONTROLS_i + IndustryDummies + \varepsilon \quad (9)$$

The results of the propensity score are presented in *Table 16*.

Table 16. Estimation results of Logit model in PSM

Variables	(1) POST Credit spreads	T value	(2) POST Credit spreads	T value	(3) POST Credit rating	T value	(4) POST Credit rating	T value
SOE	0.986	2.39	0.948	2.34	1.171	2.92	1.134	2.88
UNDRR(Score)	-16.207	-2.85			-14.619	-2.71		
UNDRR(TOP 5)			-1.266	-2.69			-1.154	-2.53
Credit rating	0.429	1.40	0.429	1.40				
Collateral	-1.070	-2.58	-0.992	-2.42	-0.955	-2.50	-0.884	-2.35
Option	2.863	6.06	2.900	6.09	2.730	6.05	2.766	6.11
Auditor	-0.504	-1.29	-0.483	-1.24	-0.394	-1.01	-0.357	-0.93
Log(Bondterm)	-3.000	-3.95	-3.040	-4.00	-0.578	-3.69	-0.590	-3.75
Log(Bondsize)	-0.259	-0.84	-0.297	-0.97	-0.031	-1.35	-0.033	-1.46
Total asset	0.000	-0.31	0.000	-0.72	0.000	0.97	0.000	0.59
Liquidity	0.003	2.38	0.004	2.55	0.003	2.15	0.003	2.29
ROA	-0.163	-1.72	-0.177	-1.85	-0.163	-1.74	-0.177	-1.87
Asset-liability ratio	0.026	1.79	0.028	1.87	0.020	1.40	0.021	1.46
Long-term solvency	-0.007	-0.61	-0.006	-0.52	-0.007	-0.63	-0.007	-0.57
GDP	0.000	2.09	0.000	2.19	0.000	1.94	0.000	2.05
LTD	-0.018	-3.42	-0.017	-3.24	-0.017	-3.39	-0.016	-3.22
Constant	1.612	0.90	1.308	0.73	1.082	0.87	0.774	0.63
Industry dummies	Yes		Yes		Yes		Yes	
Observations	329		329		331		331	
R-squared	0.4188		0.4128		0.4059		0.4003	

Note: This table presents the propensity score calculated based on the logit model. To avoid the influence of industry factors on the analysis results, we also add industry dummy variables here. To find the matching objects of the treatment group (sample after the occurrence of the default event) from the control group (sample before the occurrence of the default event) relying on multidimensional matching, we select the financial indicators and bond characteristic indicators used above as our covariates. The specific model is—

$$POST = \alpha_0 + \alpha_1 SOE_i + \alpha_2 UNDRR_i + \alpha_3 Creditrating_i + \alpha_4 FIN_i + \alpha_5 BOND_i + \alpha_6 OTHERCONTROLS_i + IndustryDummies + \varepsilon$$

$$POST = \beta_0 + \beta_1 SOE_i + \beta_2 UNDRR_i + \beta_3 FIN_i + \beta_4 BOND_i + \beta_5 OTHERCONTROLS_i + IndustryDummies + \varepsilon$$

The control variables and returns are winsorized at the 1st and 99th percentiles.

Table 17 presents the basic condition of each variable based on the nearest-neighbor matching method according to the logit model, comparing it with the one before using the matching method. There is no significant difference in the mean value of each variable after matching, indicating that each variable is balanced between the treatment group and control group. Based on the result, we notice that some of the variables can be deleted as they are not significantly different from before and after the matching. After the adjustment, we used the variables in *Table 17* as covariates. In addition, most of the standard biases after matching are less than 5% in spreads and rating, indicating that the parallel hypothesis is effectively satisfied.

Table 17. Adjusted variables before and after matching in PSM

Variables	Matching	Mean		Bias (%)	t-test	
		treated	Control		t	p
SOE	unmatched	0.62821	0.56917	12	0.92	0.357
	matched	0.6087	0.55072	11.8	0.69	0.494
UNDRR(Top 5)	unmatched	0.16667	0.26482	-23.9	-1.77	0.077
	matched	0.18841	0.24638	-14.1	-0.82	0.413
Collateral	unmatched	0.39744	0.60079	-41.4	-3.2	0.002
	matched	0.42029	0.37681	8.8	0.52	0.605
Option	unmatched	0.75641	0.26877	111.3	8.53	0
	matched	0.72464	0.75362	-6.6	-0.39	0.701
Log(Bondterm)	unmatched	5.1154	5.417	-20.3	-1.52	0.13
	matched	5.1159	5.2029	-5.8	-0.38	0.707
Liquidity	unmatched	175.3	146.86	21.7	1.64	0.101
	matched	160.49	147.3	10.1	0.68	0.5
ROA	unmatched	1.8051	2.8088	-42.8	-3.04	0.003
	matched	1.8398	1.8537	-0.6	-0.04	0.968
Asset-liability ratio	unmatched	56.828	52.127	27.6	2.23	0.026
	matched	55.57	54.834	4.3	0.24	0.807
Long-term solvency	unmatched	0.68784	4.7278	-30.6	-2.16	0.032
	matched	2.0943	1.2433	6.4	0.39	0.699
LTD	unmatched	64.799	125.71	-94.8	-6.02	0
	matched	65.631	49.669	24.9	3.48	0.001

Note: This table presents the basic status of each variable based on the nearest-neighbor matching method before and after matching according to the logit model.

Based on the results of sample matching, *Table 18* presents the Average effect of the Treatment on the Treated (ATT) values of different matching methods: nearest neighbor, radius, and kernel. We thus explored the exact impact of the default event on the spreads and rating of the corporate bond and explored the sensitivity difference to the default event based on heterogeneous and issuer ownerships and leading underwriter reputations. As shown in *Table 18*, spreads reduced significantly after the default. The ATT values are significantly negative, and the result seems inconsistent with intuition. This is possible because the bond market participants tend to be more rational after the first default. Investors may be more cautious, preferring bonds with lower default probability, such as bonds issued by SOEs. For ratings, though their difference is not as wide as the spreads difference, it still improved. Rating agencies also became more cautious, in line with investors.

For the issuer ownership aspect, we further distinguished between SOEs and NSOEs to support the main conclusions. Classifying the SOEs and NSOEs shows that the spreads of the state-owned group significantly decreased, while the credit rating significantly increased. The result confirms our hypothesis—after the default event, investors and rating agencies are more inclined toward state-owned issuers and the ownership effect is more obvious. From the perspective of spreads, the role of the reputable underwriter changes little before and after the default. However, compared with the unknown underwriter, it can help the enterprise in reducing the spreads. In terms of rating, the role of well-known lead underwriters weakened substantially. After the default, the impact of well-known underwriters on bond rating was even less than that of unknown lead underwriters. This also supports the hypothesis that, after the default event, the impact of the underwriters was relatively weak.

Table 18. The ATT value in PSM

Variables	Matching		Full sample			
			Treated	Controls	ATT	T
Credit spreads	Unmatched		2.405	2.788	-0.383	-2.780
	Matched	Nearest neighbor	2.482	2.517	-0.035	-0.130
		Radius	2.482	2.487	-0.005	-0.020
		Kernel	2.482	2.495	-0.013	-0.060
Credit rating	Unmatched		3.705	3.739	-0.034	-0.320
	Matched	Nearest neighbor	3.739	3.551	0.188	0.830
		Radius	3.739	3.594	0.146	0.820
		Kernel	3.757	3.585	0.172	0.940
	Matching		SOE		NON SOE	
			ATT	T	ATT	T
Credit spreads	Unmatched		-0.590	-4.140	0.081	0.360
	Matched	Nearest neighbor	-0.434	-1.590	0.338	0.720
		Radius	-0.320	-1.420	0.327	0.780
		Kernel	-0.302	-1.370	0.260	0.610
Credit rating	Unmatched		0.013	0.100	-0.213	-1.460
	Matched	Nearest neighbor	0.158	0.580	0.389	1.240
		Radius	0.231	1.110	0.115	0.410
		Kernel	0.262	1.240	0.136	0.490
	Matching		TOP 5		NON TOP 5	
			ATT	T	ATT	T
Credit spreads	Unmatched		-0.825	-3.220	-0.358	-2.290
	Matched	Nearest neighbor	-0.418	-0.820	0.196	0.570
		Radius	-0.325	-0.680	0.187	0.610
		Kernel	-0.127	-0.360	0.179	0.580
Credit rating	Unmatched		0.033	0.270	0.033	0.270
	Matched	Nearest neighbor	0.200	0.820	0.200	0.820
		Radius	0.277	1.220	0.277	1.220
		Kernel	-0.200	-0.280	0.254	1.120

Note: This table presents the ATT value of different matching methods: nearest neighbor, radius, and kernel.

5. Conclusion

Using a sample of 470 Chinese corporate bond issuance data from 2008 to 2015, we found that newly issued bonds with state-owned ownership and prestigious underwriter reputation have lower credit spreads and higher credit rating. Moreover, the stated-owned ownership property is always the dominant impact on the credit spreads and rating, compared with the influence of underwriters' reputation. After the first default occurred, the effect of the underwriter reputation weakened, and the effect of state-owned ownership became more pronounced. Evidence documented in this study reveals that the expectation of rigid payment on default bonds is built through identifying the extent of connection between the government and the bond issuer. As a result, when government intervention weakens on the whole market, investors and rating agencies then pay more attention to whether the issuer has a direct government connection rather than other implicit guarantee factors. This study better captures the effective marketization process in China's corporate bond market.

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In the "FuXi event" of 2006, the main underwriter, ICBC, actively organized the creditor's committee to protect the rights and interests of the creditors. In 2015, numerous investors and rating agencies expected the leading underwriter, China Construction Bank, to guarantee "11 TianWei MTN2," the first SOE's default. On September 20, 2016, Hua Chuang Securities was sued by the fund for its inability to repay its debts on schedule. In July 2017, it was also sued by the HuaXia fund. This indirectly indicates that investors and rating agencies expect the leading underwriters to be parts of the rigid payment.

We define $Auditor$ as either Big Four or Top Ten, which produces similar empirical results, such as Chen, Shi, and Xu (2013).

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